The Refrigeration Service Engineer

Vol. 7
No. 8

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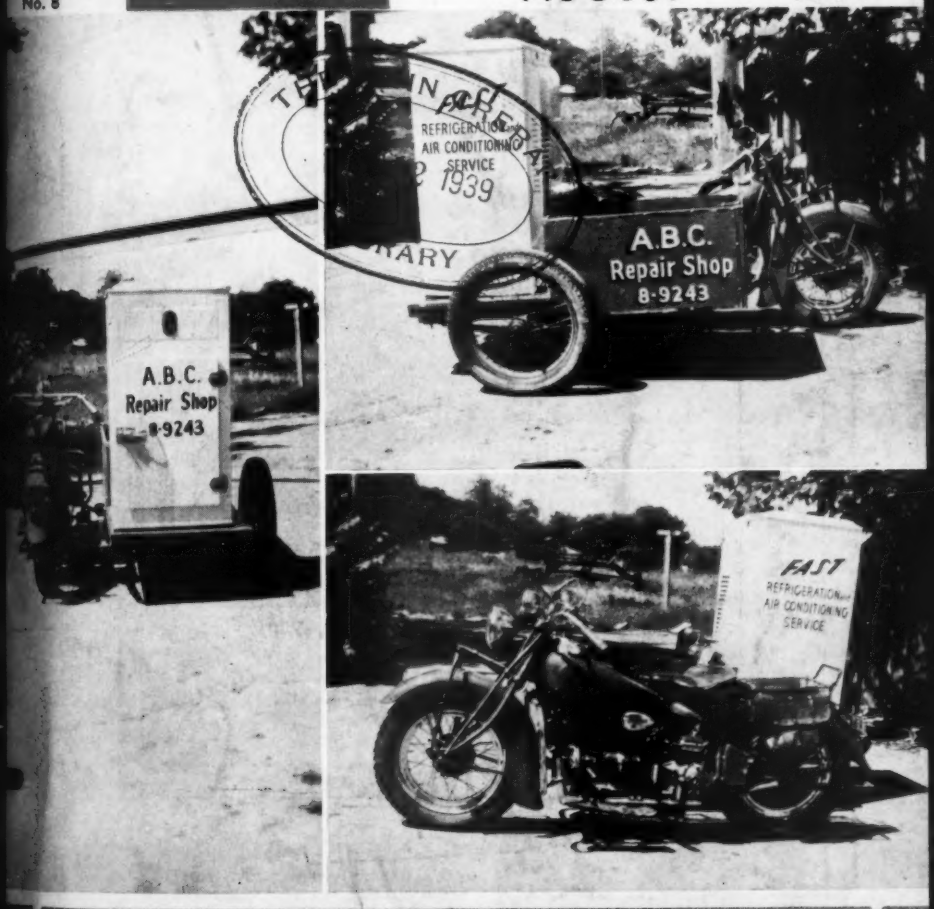
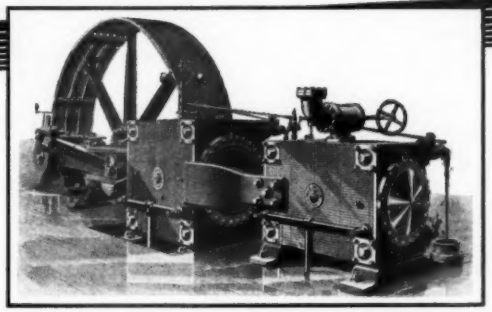


SERVEL HERMETIC UNIT • COMPARISON OF THE CAPILLARY TUBE AND H. S. FLOAT • THE DICELER COMPRESSOR •

THE REFRIGERATION SERVICE ENGINEER, Nickerson & Collins Co., Publishers, 435 N. Waller Ave., Chicago, Ill. Published monthly. Vol. 7, No. 8, August, 1939. Entered as second class matter March 4, 1938, Chicago, Ill., under the Act of March 3, 1879. Subscription in United States, $2.00 per year; all other countries, $3.00 per year.

One of the World's Oldest Makers of Thermo Valves

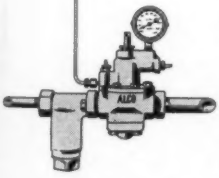


ALCO

Still Leads the Field of REFRIGERANT CONTROL

More than 12 years ago, when Alco Valve Company patented one of the first thermostatic expansion valves for refrigerant control, the accuracy and dependability of this type of valve led the field. Today, through years of research, experimentation and improvement, Alco, the pioneer, still leads!

As compressors developed from types similar to that shown above, Alco has steadily improved the design and performance of Alco Thermo Valves to meet new applications and new performance standards. Contrast the early Alco Valve at the left—large, complicated, with many parts—with the light, yet sturdy streamlined efficiency of an Alco Thermo Valve of today shown below.



An Alco Thermo Valve of 12 years ago.

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ENGINEERED REFRIGERANT CONTROLS — ALCO — FOR HIGHEST EVAPORATOR EFFICIENCY

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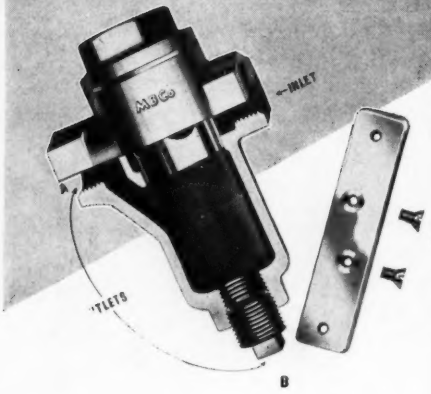

● The new Water Strainer may be used for either straight through or angle installations on water or refrigerant lines by plugging out (A) or (B) as desired. Cap and screen are readily removed—easily accessible for cleaning.

This strainer is furnished with steel mounting plate and screws. On copper pipe installations, where rigidity may be required, the mounting plate may be used to fasten strainer to wall or other convenient location. Threaded adapters are used with copper pipe. Mounting plate is not required with rigid, threaded pipe.

WATER STRAINER

Specifications—Body, Specially Processed Dense Bronze Casting. Screen, 100 Mesh Welded Monel 5¼" Area.

Catalog No.	Description
A-13658	⅜" Female Pipe Thread
A-13660	¼" Female Pipe Thread

Overall Length 4¼"
Diameter of Body ⅞"

LIQUID LINE FILTER—

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Catalog No.	Description	
	Inlet	Outlet
A-13661	¼" Male Flare	¼" Male Flare
A-13691	⅜" Male Flare	⅜" Male Flare
A-13692	¼" Fem. Flare	¼" Male Flare
A-13693	⅜" Fem. Flare	⅜" Male Flare
A-13694	¼" Male Flare	¼" Male Flare

MUELLER BRASS CO.

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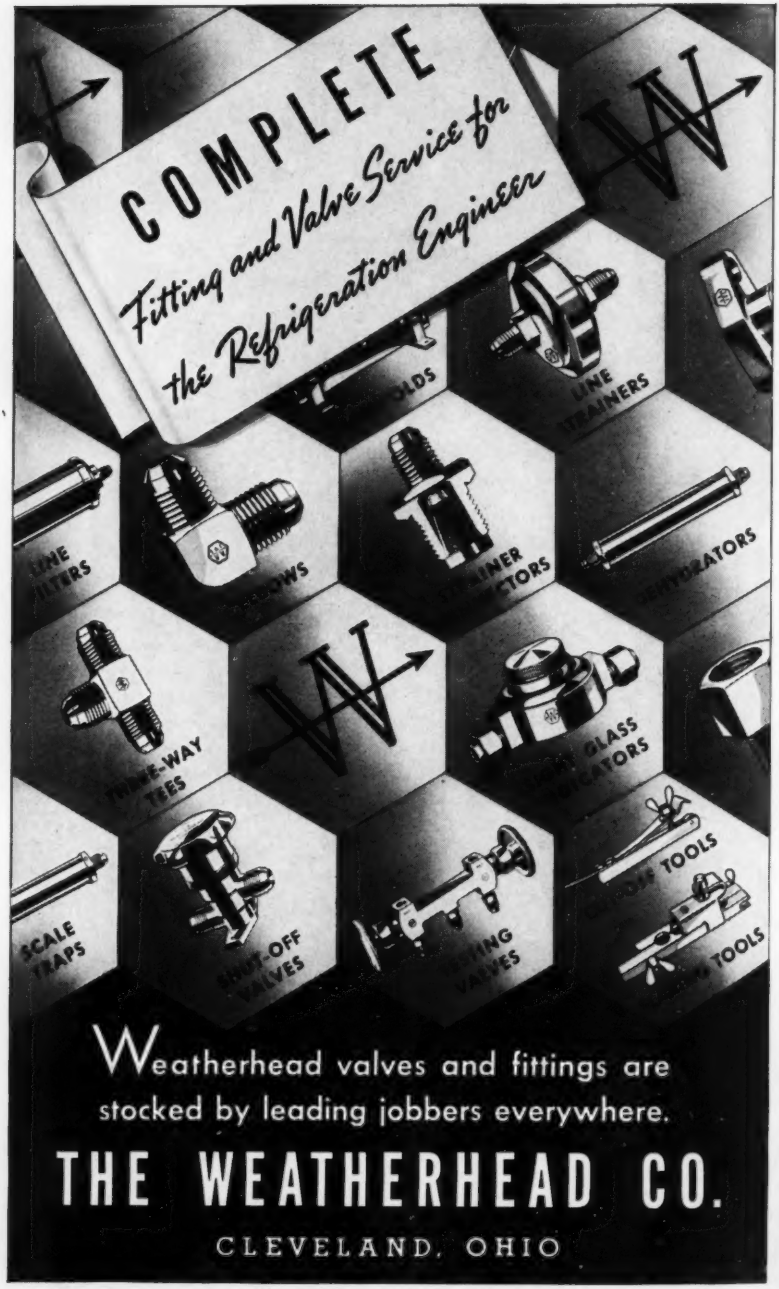
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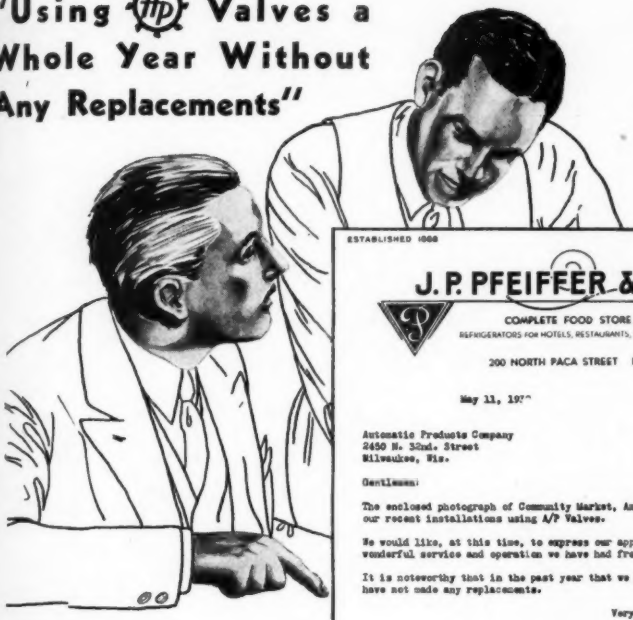

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AUTOMATIC DEFROSTING

UNIFORM FIXTURE TEMPERATURE
Regardless of Load or Weather Conditions

For Single or Multiple Systems. Low-Priced—Easily Installed.

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SHRINKAGE LOSSES SHARPLY REDUCED
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Ask any merchant what it would mean to him to have *constant fixture temperature* in his walk-in cooler and display cases—*with cooling coils always free from frost!* Ask him what spoilage and shrinkage cost him every month! Then—tell him about Ranco Control Type 91 G 2!

By providing a single low priced unit, *a completely successful two-temperature control,* Ranco revolutionizes food storage methods! Ranco Type 91 G 2 absolutely maintains proper fixture-air temperature—and assures defrosting of the coil *under all load and weather conditions.* By providing adequate air circulation through frequent cycling—even during light load periods—humidity conditions are greatly improved.

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For the first time in the history of commercial refrigeration, it is now possible, with a single two-temperature control unit, to *constantly* maintain high relative humidity and *balanced control* of coil and fixture-air temperatures.

This new Ranco CUTS IN only when the coil is defrosted and CUTS OUT only when the refrigeration requirements in the fixture are satisfied. The operating differential varies with each slight change of conditions to provide the exact amount of required refrigeration!

RANCO INC. Columbus, Ohio, U. S. A.

RANCO TWO-TEMPERATURE COMMERCIAL CONTROL

The Refrigeration Service Engineer

Vol. 7 No. 8

August 1939

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

Official Organ
REFRIGERATION SERVICE ENGINEERS SOCIETY

Cover

The service unit shown on this month's cover provides light weight, economical transportation, together with unusual advertising value. For further information on it, turn to page 56.

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TABLE OF CONTENTS

The Refrigeration Service Engineer

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Constructing Insulated Milk Tanks*

TO maintain milk at the high standard of quality demanded today, it must be cooled quickly and kept at a low temperature until delivered. If on the other hand it is not cooled properly it soon sours, resulting in a direct loss to the producers.

Milk regulations often require that milk be cooled to 50 degrees F. or lower, in which case it usually is necessary to use ice or mechanical refrigeration as the temperature of running well or spring water generally is above 50 degrees in summer. Running water may be used to pre-cool milk—that is, to lower its temperature by about 20 or 30 degrees immediately after it is drawn, thereby saving on cooling costs but mechanical refrigeration becomes necessary in reducing the temperature to the final degree.

One of the more popular and perhaps most economical methods of cooling is through the use of an insulated cooling tank in which the milk cans are partly submerged in cooled water, using well water or mechanically cooled water.

What Size Tank to Build

The proper size tank to build will depend upon the number of cans it is to hold plus the necessary cooling water. To obtain rapid, efficient cooling, there should be about three times as much water in the tank as there is milk in the cans.

Table 1 shows inside dimensions for tanks holding from four to twelve cans (40-quart size), and the proper amount of water. Space is also provided for ice or the cooling coils for refrigerating units. A tank in which ice is used for cooling can later be equipped with mechanical refrigeration.

Locating the Tank

Most dairymen locate the cooling tank against one wall of the milk room. The labor of lifting cans in and out of the tank is made easier and insulation improved when the tank is placed partly below the floor level. The excavation should be slightly larger than the outside dimensions of the tank to allow room for setting forms. The hole is dug two feet five inches below the level of the finished floor.

Overflow and Drain

Fittings for the overflow and drain are set so that the top of the coupling in which the overflow pipe is screwed will be flush with the finished floor in the tank. When

* Excerpts from Bulletin by Portland Cement Association, Chicago.

TABLE 1—INSIDE DIMENSIONS OF INSULATED MILK COOLING TANK FOR ICE OR MECHANICAL REFRIGERATION

Capacity of Tank						
Total Storage Capacity 40-Qt. Cans	Cans Cooled per Milking—One Cooling Daily 40-Qt. Cans	Cans Cooled per Milking—Two Coolings Daily 40-Qt. Cans	Capacity of Tank, Gallons	Inside Length, Inches	Inside Width, Inches	Inside Depth to Plate Inches
4	4	2	170	46	40	25
6	6	3	260	72	40	25
8	8	4	350	98	40	25
10	10	5	450	124	40	25
12	12	6	550	150	40	25

Notes for Table 1:—Where night's milk is allowed to remain in the tank while morning's milk is cooled, a tank large enough to hold the cans from *two* milkings is needed. Where only the night's milk is cooled, or where the cooled night's milk is taken out to make room for the morning's milk, the tank need be only large enough to hold the cans from *one* milking.

the overflow pipe is removed this outlet serves as a drain. A good location for the overflow pipe is in the middle of one end about five inches from the inside wall. The overflow pipe and coupling may be of brass or wrought iron and the trap of cast iron or vitrified pipe.

Constructing Base Slab

A fill of cinders, gravel or coarse sand 6 inches deep is recommended, tamped to make an even, firm base. The concrete base is made 4 inches thick. The mixture should be fairly stiff, and should be carefully leveled off to provide an even surface on which to lay the insulation.

Placing Insulation

Cork board or other equally effective insulating material three inches thick is used. Cork board is regularly furnished in pieces 12 inches wide and 36 inches long.

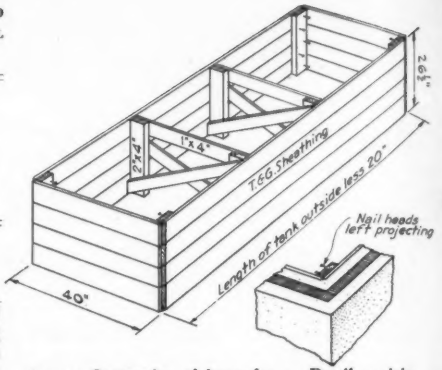


Fig. 1—Perspective of inner form. Detail at right shows how corner of form is made.

Floor insulation is placed first, being laid on the concrete base. A hole is cut in the piece placed over the drain pipe, leaving a ½-inch opening all around the pipe to be filled with hot asphalt. Insulation for the end and side walls is then erected. Raw edges exposed by sawing are waterproofed by painting with hot asphalt. Also apply hot asphalt or seam filler at all joints where pieces butt together.

Waterproofing Insulation

Since most insulating materials lose their value as insulators when wet, they must be kept absolutely dry. Insulating board is therefore waterproofed by mopping with hot asphalt on all surfaces. Edges are again painted with the hot asphalt when the pieces are fitted together. The board should be cut to fit before being waterproofed. As a further precaution to keep out moisture, the insulation is often covered with a woven cotton fabric and again mopped with hot asphalt.

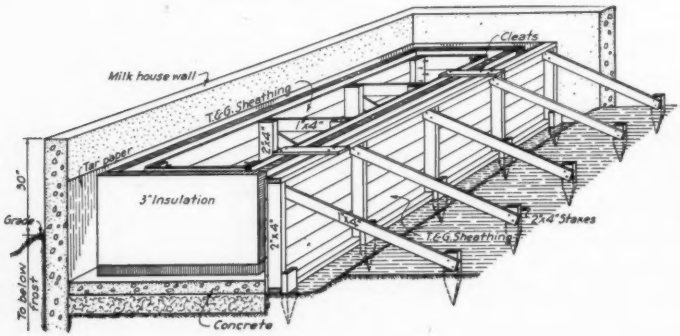


Fig. 2—Inside and outside forms, showing method of bracing and anchoring. All forms should be sturdily constructed using good lumber.

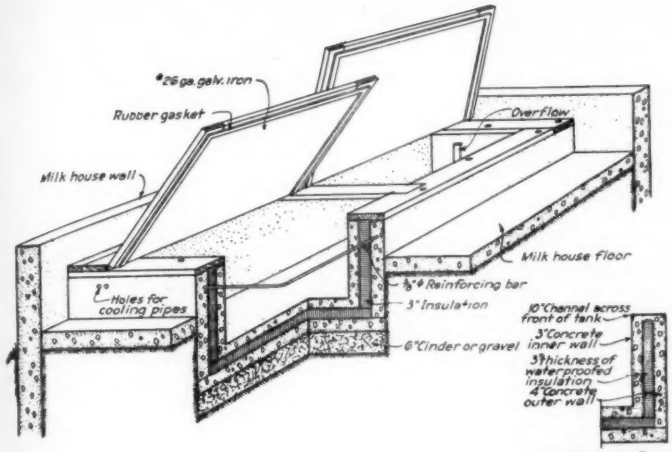


Fig. 3—A cutaway view of the cooling tank which shows the completed construction. An alternate design for the tank rim is shown at the right.

Forms for Wall

Forms are made of one-inch dressed and matched lumber stiffened with two by four-inch studs and are erected after insulation is in position and all measurements are checked. Faces of the inner and outer forms are held exactly 10 inches apart by placing spacers—wood blocks 4 inches long—between outer form and the insulation; blocks three inches long between insulation and inner form face. These blocks are removed as forms are filled with concrete. Where the tank extends entirely across the end of a milk house the foundation wall serves as the outer form on the ends and one side of the tank. Place a strip of tar paper against the foundation wall to separate the tank and

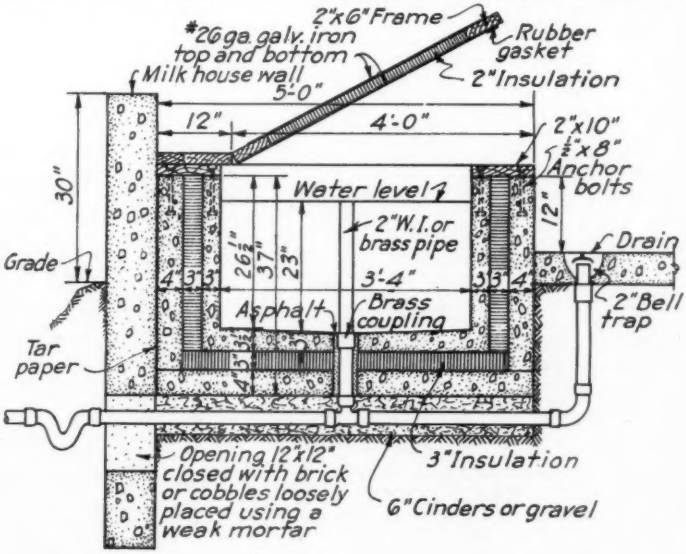


Fig. 4 — Cross sectional view of the completed tank.

TABLE 2—QUANTITIES OF MATERIALS FOR INSULATED CONCRETE TANKS

(All tanks 40 inches wide, 25 inches deep, inside dimensions)

Materials	Unit of Measurement	Size of Tank				
		4-Can	6-Can	8-Can	10-Can	12-Can
3-inch Insulation	Sq. Ft.	63	84	105	125	144
Cement	Sacks	11	14	17	21	24
Sand	Cu. Ft.	22	28	34	42	48
Pebbles	Cu. Ft.	22	28	34	42	48
Reinforcing rods ⅜-inch	Feet	22	27	31	37	42
2-inch Insulation	Sq. Ft.	14	20	26	31	40

Note :—Other materials needed include lumber for forms, lumber for plate and cover, tar paper, hinges, handles, nails, pipe fittings.

the wall. Then any settlement of the wall will not damage the tank. Form faces coming in contact with the concrete mixture should be lightly oiled. Oil from the automobile crankcase is satisfactory.

Mixing and Placing Concrete

The correct mixture is given in Table 3. Place floor first, sloping it slightly toward the drain. Place a tin collar around the drain, leaving a ½-inch space. When concrete has hardened this collar is removed and the space filled with hot asphalt. Concrete for the walls is placed in the forms in layers four inches deep, care being taken to fill both the inner and outer walls to the same depth in order not to move the insulation. As the concrete is placed it is spaded. Spade carefully so as not to damage the waterproof covering on the insulation. When forms are filled to within four inches of the top, place a ⅜-inch reinforcing bar in the center of the outer wall, extending around the tank. Lap splices 15 inches.

When the forms are completely filled, ½ by 8-inch anchor bolts are set two feet apart in the concrete with threaded ends projecting about 1¾ inches. The plate or rim for the cover is attached to these bolts.

In warm weather the forms usually can be removed in 24 hours. More time should be allowed in cool weather. After the forms are removed, the inside of the tank is painted with a wash of cement and water having about the same consistency as thick cream. The concrete should be cured by covering the tank with burlap and keeping it constantly moist for seven days. This curing is essential to secure a strong, watertight concrete.

Constructing Rim and Cover

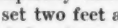
After the concrete has hardened, the plate or rim, consisting of two by ten-inch planks, is attached to the anchor bolts. A thin bed of mortar, one part portland cement and two parts sand, is spread over the top of the wall to secure a close fit for the plate. The nuts on the anchor bolts are counter-sunk in the plate so that the cover will close tightly. Sometimes a channel iron rim is placed across the front of the tank to protect it from damage by the milk cans. Pieces of strap iron screwed to the wood plate serve the same purpose.

The cover consists of a two by six-inch framework filled with a two-inch thick insulation and covered on the top and bottom with 26-gauge galvanized sheet metal. Rubber gaskets—old auto inner tubes or rubber weather stripping—are tacked around the edges of the cover to seal all joints. Hinges should be of galvanized metal. Covers for tanks eight feet long or longer are built in two sections for greater ease in opening.

In order that an uninsulated tank can be converted into an insulated tank later if so desired, it should be made to have the same outside dimensions as an insulated tank. Then the insulation and inner wall can be installed later.

TABLE 3—RECOMMENDED PROPORTIONS OF WATER TO CEMENT AND SUGGESTED TRIAL MIXES

Kind of Work	Add U. S. Gal. of Water to Each Sack Batch if Sand Is			Suggested Mix for Trial Batch			Maximum Size of Coarse Aggregate, Inches
	Wet	Damp	Dry	Cement Sacks	Sand Cu.ft.	Pebbles Cu.ft.	
Footings and Foundation Walls..	5½	6¼	7	1	2¾	4	1½
Milk House Floor.....	5	5½	6	1	2¼	3	1
Milk Cooling Tank.....	4	4½	5	1	1¾	2	¾



Mr. D. W. Wells,
New York.

Please find inclosed check for $1.25 for which send me postpaid 1 binder for the best magazine that I know of—for real news, engineering—and a swell lot of information that is in THE REFRIGERATION SERVICE ENGINEER.

The Servel Hermetic Unit

Its Construction, Operation and Field Service

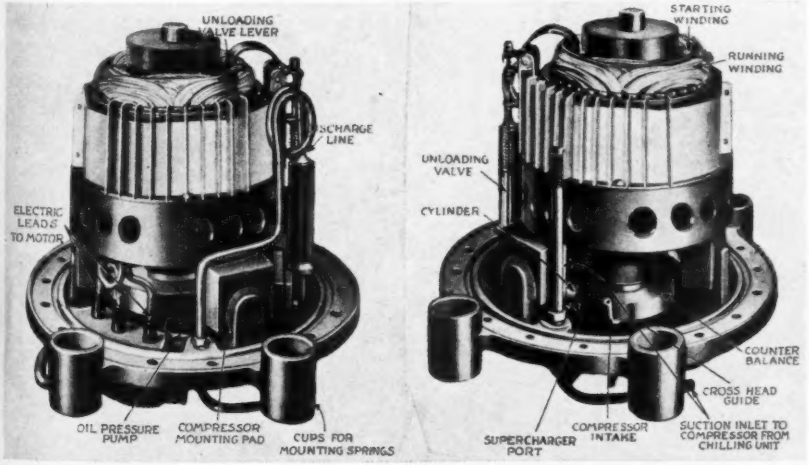
The Servel electric hermetic unit is no longer manufactured, but due to the large number of these units still operating in the field and the number of inquiries received regarding its operation and construction it is felt that the following information will be helpful.—EDITOR.

THE unit consists of a specially designed vertical electric motor directly connected to a horizontal reciprocating pump through a hollow counter-balanced crankshaft. The crank pin engaging a cross-head which slides in the cross-head guide and cylinder assembly reciprocates the cylinder assembly on the fixed piston.

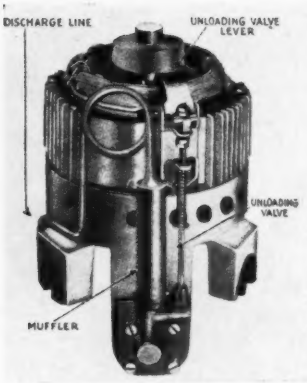
The motor and pump unit are sealed under the "Derby Hat" or dome which receives the vapor from the chilling unit. As may be seen by Fig. 1 the dome is bolted to the unit base and sealed by the use of a gasket. The cross-head also acts as a mechanically operated intake valve which delivers the vapor to the cylinder. Just before the cylinder gets to the end of the stroke the piston uncovers a simple slot in the cylinder wall which has a super-charged effect and fills the cylinder with vapor so that a full charge is pumped on every stroke. The vapor is discharged through the hollow piston into the radiator.

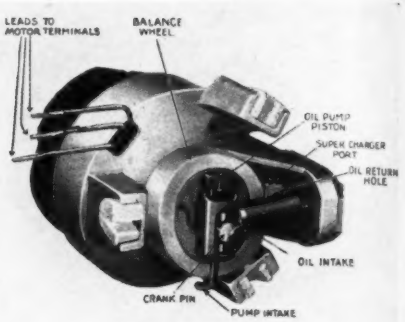
The oil pressure pump cylinder is formed by a projection on the cross-head and the piston is fastened to the end of the cross-head guide. Suitable slots cut into the crank pin constitute the suction and discharge valves of the oil pump. These slots connect to the oil intake pipe and the hollow shaft. The oil is discharged to the bearings by suitably located holes and oil grooves.

When the unit is started the current is caused to flow through the starting winding of the motor. This sets up a magnetic field which starts the motor turning and at the same time pulls down the unloading valve lever thus raising the unloading valve from its seat. This permits the motor to start the pump without load, due to the equalization of pressure through this valve. When the



Figs. 1 and 2—Showing the dome of the compressor removed exposing the various parts of the unit.





Figs. 3 and 4—The compressor removed from the dome base.

motor gains speed the magnetic field disappears, the unloading valve returns to the closed position and the pump proceeds to remove the vapor from under the dome and chilling unit. It is forced into the radiator where its heat is dissipated, thus returning to its liquid state.

The entire assembly is made from especially selected steel and semi-steel castings. The wearing parts are selectively hardened and then ground to a mirror-like finish. This process produces a piece which while extremely tough, has wearing surfaces that are glass hard. Wear is further reduced by flooding with oil all contact surfaces by force feed lubrication from the mechanical oil pump.

A header type flooded evaporator is employed on the unit and the refrigerant is metered to it by a capillary tube. The temperature is controlled by a bellows type thermostat which is built in with the relay at the back of the cabinet.

Like other hermetic units, field service is limited to the adding of methyl chloride to the system and to the correction of electric troubles which may occur outside of the motor dome.

To add refrigerant to the system it is necessary to remove the pinched off charging connection shown in Fig. 7 and solder in a new charging line to which your gauge and drum may be connected. Methyl chloride should be added and the unit permitted to run until frost appears on the return line. When the evaporator is down to temperature

TABLE I—REFRIGERANT AND OIL DATA.

Year	Cabinet Model	Comp. Model	H.P.	Refrigerant Amount	Oil
1930	SE-3	HS-10A	¼	1 lb.	380 CC
	SE-4	HS-10	¼	1 lb.	380 CC
	SE-5	HS-10B	⅛	1 lb.	380 CC
1931	SE-3	HS-10E	¼	1 lb.	380 CC
	SB-3A	HS-10E	¼	1 lb.	380 CC
	SE-4	HS-10D	⅛	1 lb.	380 CC
	SB-4	HS-10D	⅛	1 lb.	380 CC
	SE-5	HS-10C	⅛	1 lb.	380 CC
	SB-5B	HS-10C	⅛	1 lb.	380 CC
	SC-3C	HS-10F	⅛	1 lb.	380 CC
	SC-6	HS-10G	⅛	1 lb.	380 CC
	SE-7	HS-15	⅙	2 lbs.	750 CC
	SB-11	HS-15A	⅙	2 lbs.	750 CC
	SE-9	HS-15B	⅙	1 lb.	750 CC
	SB-9	HS-15B	⅙	1 lb.	750 CC
1932	SB-7	HS-15C	⅓	1 lb.	1½ pt.
1933	SD-65	HS-10M	¼	1 lb.	¾ pt.
	SDP-65	HS-10M	⅛	1 lb.	¾ pt.
	SD-85	HS-10M	⅛	1 lb.	¾ pt.
	SDP-85	HS-10M	⅛	1 lb.	¾ pt.
	SD-45	HS-10N	⅛	1 lb.	¾ pt.

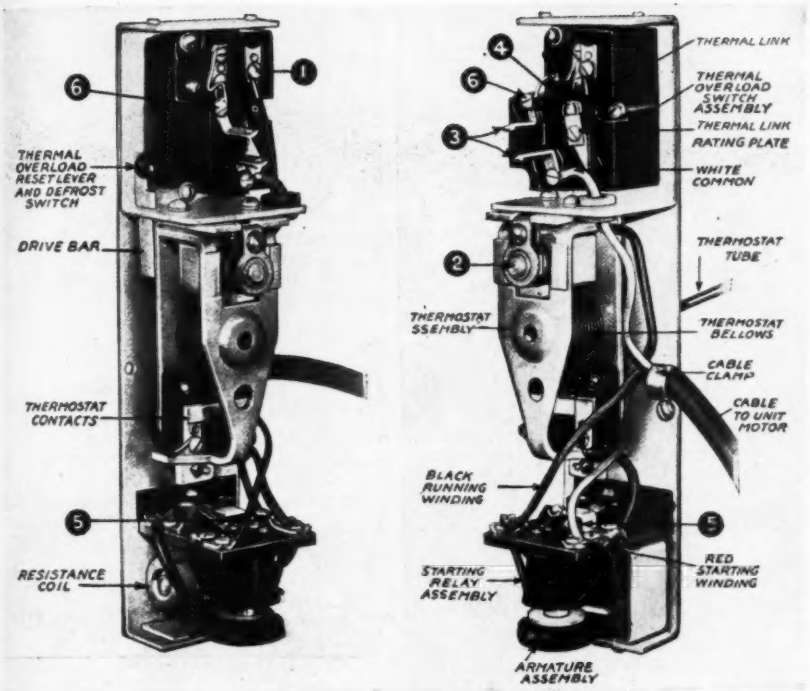


Fig. 5—Two views of the electrical control and its operating parts.

sufficient gas should be purged off so that the frost line returns to within six inches of the evaporator.

The total amount of refrigerant in each model is shown in Table I.

Thermostat and Switch Assembly

The complete control switch is mounted on the unit frame and located in the unit compartment or flue at back of refrigerator. See Fig. 7. It consists of—

1. A thermostat assembly to automatically control the starting and stopping of the compressor.

2. A thermal overload switch assembly to protect the motor against damage from low voltage or overload. Under these conditions this will automatically open the circuit. The circuit will remain open until manually reset by turning pointer on temperature control to off—then to chilling.

3. A starting relay assembly that automatically closes the circuit through the starting winding of the motor until the motor speed has reached a pre-determined point at which time the starting winding circuit is automatically opened.

In normal operation the flow of current through the C-H type control is as follows:

When the temperature of the chilling unit rises, the increased pressure in the thermostat bellows due to the temperature rise causes the circuit to be closed at the thermostat contacts. See Fig. 5. The current now flows through the thermal link, then through the thermal overload switch, thermostat contacts and starting winding relay to running winding of motor field.

The flow of current through the relay at time circuit is closed approximates five amperes for about one to two seconds which causes the switch armature assembly to be lifted which in turn causes contact to be made at contacts (5), allowing current to flow through the starting winding of motor field.

Since the motor reaches full speed almost

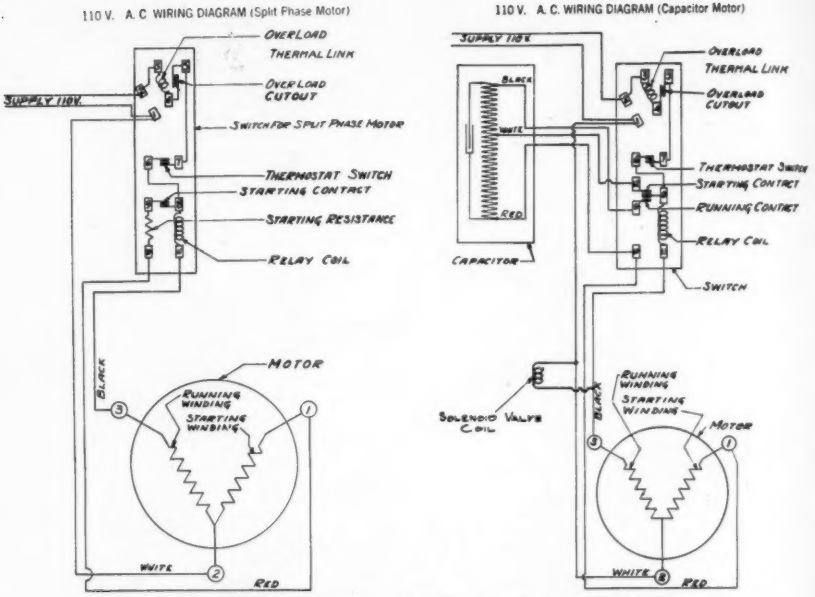


Fig. 6—Complete wiring diagrams on the split phase and the capacitor motor.

instantly and a natural reduction of amperage demand follows, the remaining flow of current through the relay coil is not great enough to hold armature up. It therefore drops of its own weight breaking the circuit at contact (5), thus stopping the flow of current through the starting winding of motor field.

The flow of current through the running winding of the motor continues until the circuit is again broken by the automatic operation of the thermostat or hand operation of the control. The wiring diagrams in Fig. 6 show the complete circuit.

Fuses

The thermal link in the overload switch assembly provides proper motor protection against overload or low voltage. Therefore, it is unnecessary to supply additional fuse protection other than that already provided to protect the circuit to which the unit is connected unless a local ordinance demands it.

Unit Will Not Start

Check the overload relay by turning the temperature regulator to off position on dial and then returning it to chilling position.

See that electric cord is properly connected to house circuit and refrigerator and that there is current to the refrigerator.

If the thermostat contacts Fig. 5 are open and the chilling unit is warm, the thermostat bellows has lost its charge, and the complete thermostat switch assembly should be replaced.

In the event the thermostat contacts are closed replace electrical connection in switch and note when this is done whether the armature assembly causes contact at contacts No. 5. Fig. 5. If the armature assembly is not instantly drawn up to make contact, the trouble is within the starting relay assembly and the entire thermostat switch assembly should be replaced from your stock.

If the unit will not run due to defects within the unit itself or because of a low voltage condition, the resulting excessive flow of current through the relay coil in the relay assembly will cause the armature to lift and contact to be made at contact points, No. 5, in a chattering or fluttering manner until the thermal link in the thermal overload switch breaks the circuit through softening the fusible metal in pin No. 4. (See Fig. 5. This is the protection device incorporated in this control switch.)

If after resetting the temperature regulator a number of times this condition continues, test for low voltage.

Note: Several minutes should elapse in which to allow the thermal link to cool before attempting to reset temperature regulator when machine has been stopped by heater coil breaking circuit.

If Unit Will Operate Continuously, But Chilling Unit Will Not Frost, the difficulty is within the unit and to correct the condition the entire unit should be changed.

If Unit Will Operate Continuously Refrigerator Temperature Not Satisfactory: If this condition exists remove the center ice cube tray, and with a reliable thermometer check the temperature on the aluminum conductor plate. A pocket "Tycos" thermometer or equal should be used for this purpose, and the thermometer should be placed on the conductor plate so that the temperature can be read without removing the thermometer from the chilling unit.

Set the temperature regulator at "Chilling." Close the cabinet door and after about twenty minutes the thermometer should indicate approximately 14° F.

If the temperature is considerably below this point, the entire thermostat switch assembly should be changed.

If the temperature is considerably above this point the trouble may be due to a low refrigerant charge. If evaporator is not frosted all the way up and the suction line is warm, the system probably needs refrigerant. If no other symptoms are indicated other than temperature too high the trouble, no doubt is within the unit itself and should be returned to the shop.

Unit Will Cycle But Chilling Unit Will Defrost: A reliable general criterion of proper operation of the thermostat switch is the temperature on the conductor plate as indicated above. However, where the unit is cycling either too often or apparently at too long intervals, the temperature on the conductor plate should read approximately 14° F. at the time the machine unit cuts-off. Any wide variation from this will indicate thermostat trouble and the thermostat switch assembly should be changed.

Unit Will Cut Off On Thermal Link After Operating On Normal Cycle: If a unit is found to be cutting off on the thermal link, after operating on normal cycles, the difficulty can be caused by—

a. Low voltage. This should be checked as previously indicated with an approved voltage tester at the start of the operating cycle.
b. Poor contact at the relay contact points. It is possible for the leaf on which the relay contact points are mounted to be bent or even loose, resulting in a poor contact when the relay core is drawn up into the relay at the start of the operating cycle.
If this condition exists, arcing will occur.

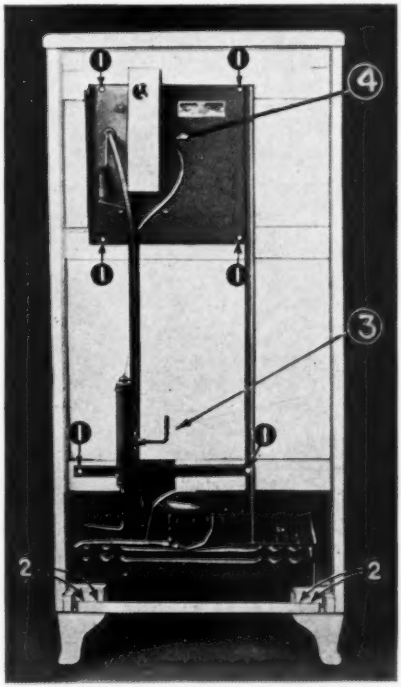


Fig. 7—Rear view of cabinet with unit in place.

A visual inspection should be made (with the connection cord disconnected) to make sure that sufficient pressure is exerted by the contact leaf to effect good contact, when the relay core is raised manually.
c. In very rare instances, this could be due to something wrong within the unit itself, and if so, this unit would eventually fall under the classification of "unit will not start."
As a criterion of the latter possibility, however, the following tabulation of

wattage consumption of the various model units is to be considered, it being understood, of course, that under extremely high temperature conditions, the wattage consumption would be in the upper brackets.

Wattage consumption to be expected under normal operating conditions, and in room temperatures of from 75 to 100 degrees F.

HS-10F	160 to 180 watts
HS-10E	160 to 180 watts
HS-10D	170 to 190 watts
HS-10C	175 to 195 watts
HS-10G	175 to 195 watts
HS-12A	160 to 210 watts
HS-15C	195 to 220 watts
HS-15A	260 to 280 watts
HS-15B	260 to 280 watts

Re-installing Unit

1. Loosen the four wing nuts on the spring suspension bolts by turning to the left (counter clockwise) as far as possible. This is necessary to secure required clearance above unit dome.
2. Examine Liner opening sleeve gasket to see that it is in place.
3. Be sure the Machine Unit Support Pads are in their respective places in the Unit.
4. Place the Unit in the Cabinet and before replacing screws examine to see that Condenser is resting on Support Pads and Liner Opening Sleeve Gasket is in proper place.
5. Replace the six wood screws which secure unit to cabinet frame at points designated (1) Fig. 7.
6. Replace bottom cross rail, tighten screws at (2)—then mount back panel.

A Comparison of the Capillary Tube and H. S. Float

BECAUSE capillary tubes and high side floats produce similar operating characteristics in the refrigerating system, they may be readily compared. The main difference in operation between them is that the capillary tube is always open to the passage of refrigerant and the pressures in the high and low sides of the system will equalize shortly after the machine shuts off, whereas a high side float which is in good operating condition shuts off the flow of refrigerant and prevents the equalization of pressures.

A capillary tube consists only of a very small bore tube with sufficient length so that the flow of refrigerant from the high side of the system to the low side will be properly restricted. In other words, the capillary tube must create sufficient restriction so that the amount of vapor that will pass through it will be considerably less than the amount pumped by the compressor and will permit a high pressure to be built up in the high side until a point is reached where the vapor will condense to a liquid and pass through the tube in the liquid form.

The inside diameter and the length of the capillary tube varies with the size and capacity of the refrigerating system and with the kind of refrigerant employed. For domestic units the inside diameter may be approximately 1/64-inch and the length will vary from 15 to 40 inches.

Almost any type of evaporator may be employed with capillary tubes, but they are usually of the flooded type with a header at the top and sometimes with a header at both top and bottom. The liquid refrigerant may enter either at the top or bottom of the evaporator as shown in Figs. 1 and 2.

When the condensing unit starts in operation the condensing pressure builds up to a point high enough to condense the vapor to a liquid and the liquid passes through the capillary tube to the evaporator. When the condensing unit stops, any liquid contained in the condenser passes through the capillary tube to the evaporator and any vapor left in the high side passes through until the pressure between the high and low sides is equalized. This equalization of pressure may take place within two or three minutes after the unit has stopped operating or it

may not completely equalize during the entire off-period depending on the size of the tube.

Usually capillary tube systems are not equipped with a receiver and there is no necessity of having one except for the purpose of pumping down the entire charge to the high side. During operation practically all the refrigerant is contained in the evaporator and there is no reserve held in the high side.

Some systems formerly equipped with other refrigerant metering devices which required a receiver have been changed over to a capillary tube, and some capillary tube systems have had a receiver installed on them. An important thing to remember where a capillary tube is used in conjunction with a receiver is that the outlet from the receiver must be at the very bottom of the receiver so that all the refrigerant will pass through the capillary tube as a liquid and that none of the liquid will vaporize and pass through as a vapor. If the refrigerant is permitted to vaporize in the receiver refrigeration will take place at this point, causing the receiver to sweat and the heat picked up at this point will be carried with the vapor into the evaporator, warming the evaporator and resulting in more frequent operation. For this reason receiver outlets should be as shown in Fig. 1 rather than as shown in Fig. 2.

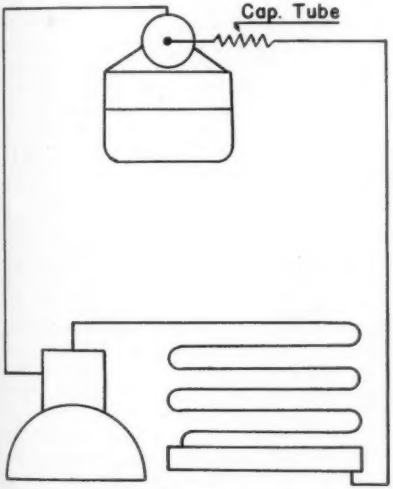


FIG. 1

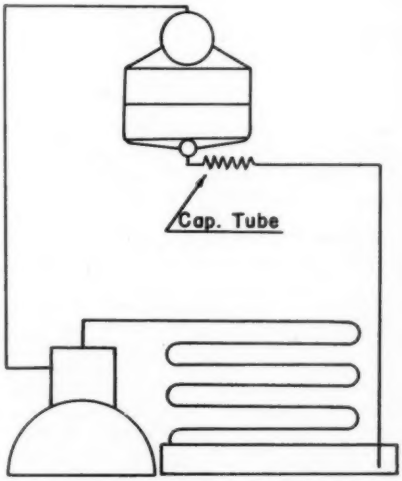


FIG. 2

Capillary tube systems are nearly always controlled with a thermostat or cold control; however, since the pressure on the low side varies with the temperature of the low side in the same manner that it does with a high side float, low side float, or thermal expansion valve, a pressure switch can be used. The only precaution necessary is that the upper setting of the switch be sufficiently high that when the pressure is equalized between high and low sides it will not immediately cause the switch to close.

Like the high side float system, the amount of refrigerant required depends on the capacity of the evaporator and for proper operation this amount should always be sufficient to completely fill the evaporator. The usual procedure in determining when the evaporator is full is to add refrigerant until frost appears on the return line, then purge off enough so that the frost returns to within about two inches of the evaporator outlet.

A fixed orifice will serve the same purpose as a capillary tube, but since there is no length to a fixed orifice which would aid restriction, the diameter of the opening would have to be much smaller than the capillary tube, thus increasing the danger of plugging.

The high side float operates from the level of the liquid refrigerant in the high side of the system. There are two general types in

use with many varieties in each type. One of the general type is a separate unit in itself while the other combines a liquid receiver with the float. Both operate in the same general manner. Refrigerant vapor is condensed to a liquid in the condenser and flows into the float valve chamber building up a liquid level until the float rises, lifting the needle off its seat and permitting some of the liquid to pass into the evaporator. As the liquid level around the float ball decreases, the needle closes, shutting off the flow to the evaporator. A definite liquid level is maintained in the float chamber.

As with the capillary tube, the amount of refrigerant in the system is dependent on the capacity of the evaporator, which must be kept full. Charging of the system is done in the same manner as with the capillary tube.

Service Comparisons

Nearly all high side floats are subject to some degree to vapor binding, which is to say, air or non-condensable gases may accumulate in the float chamber in sufficient quantities to prevent any liquid entering. Because the float operates on liquid level only it will be prevented from opening and the evaporator will be starved of refrigerant.

Floats which are separate from the liquid receiver are more subject to this trouble than where the two are combined. Where the receiver is separate from the float, all the refrigerant may be pumped down and held in the receiver without greatly increasing the pressure on the float. If the float and receiver are combined and the combination becomes vapor bound, the capacity of the condenser alone is not sufficient to contain all the refrigerant in the system and the pressure will, therefore, increase until liquid is forced into the float chamber. The trouble will be indicated by a high head pressure.

Most floats are provided with a purge valve at the top of the chamber for the manual relief of these non-condensable gases to the atmosphere. A few valves on the market contain a built-in adjustable by-pass which will by-pass the non-condensable gases from the top of the float chamber to the outlet of the valve thus permitting the gases to recirculate through the system.

This condition of vapor bound floats can be caused by installing the float in a warmer location than that of the condensing unit. If, for instance, the condensing unit were installed in a cool basement and the float valve were left in the cabinet on the first floor, the refrigerant leaving the condenser is at a lower temperature than that of the float and as the refrigerant enters the float some of it will immediately vaporize, preventing the entrance of any more liquid. For this reason the float should always be installed with the condensing unit when moving the unit to the basement.

Expansion of the gases begin at the outlet of the float and because there are usually several feet of tubing between the float and evaporator, some precautions must be taken to prevent frosting or sweating of this line. The use of small bore tubing such as ⅛-inch tubing in installations where the distance between float and evaporator is 25 feet or more will usually overcome the sweating. In shorter runs the copper tubing is usually encased in rubber tubing to prevent sweating.

Loaded check valves are often used to prevent this condition. They are installed inside the cabinet near the evaporator. The weight of the check ball or needle in these devices causes a pressure to be maintained on the liquid line sufficiently high so that the temperature of the gas in the line is never much below the ambient temperature.

Leaky Float Needle

A leaky needle in the float valve will cause liquid refrigerant to continue passing into the evaporator after the unit has stopped and after the normal liquid level in the float has been reached. If the leak is bad enough the pressures between high and low sides will have a tendency to equalize as in the capillary tube system. Because of the reserve refrigerant contained in the float over and above that required to fill the evaporator, the leaking valve needle will be indicated by frosting of the return line or a flood-back condition for the first few minutes of operation. As operation continues, the normal liquid level is built up in the float chamber and the frost line returns up the suction line for the balance of the running period.

Where it happens that the float needle leaks and there is a shortage of gas in the system at the same time there will be no indication of frost on the return line and the system will function much the same as a capillary tube in that the pressures will tend to equalize during the off-cycle.

A capillary tube is so simple in construction that practically nothing can cause trouble outside of the fact that it may become clogged. Due to the small opening

through it, small particles of dirt may easily clog it and for this reason a fine strainer or filter must always be placed ahead of the tube. Most troubles that may occur in a capillary tube system are not due to the tube but to some other part of the system.

The amount of refrigerant required in both the high side float and the capillary tube system is quite critical. If the evaporator is not full only part of it will frost, resulting in insufficient refrigeration. If there is too much gas in the system a flooded or frosted condition of the return line will result, causing water on the floor below the return line, or if the overcharge is excessive the crankcase of the compressor may sweat and the machine may run more than normal.

When changing a system from one refrigerant to another it is very seldom that any change is necessary to the high side float. The change will merely cause the float ball to float higher or lower in the liquid around it depending on its specific gravity and it will operate with more or less liquid refrigerant in the chamber.

Capillary tubes may in some cases have to be lengthened or shortened to meet the changing characteristics of the new gas used.

A combination which produces much the same kind of operation as the high side float is a solenoid valve with a fixed orifice. The fixed orifice is in the outlet of the valve. The valve is connected in series with the motor and motor control. The valve opens when the unit starts and closes when the unit stops, thus preventing the equalization of pressures. Otherwise the system operates as a capillary tube system. While such arrangements have been tried on a few machines, it is evident that they are not very successful since they have never been used to any great extent.

Fifth Article

Simplified Air Conditioning

The Psychrometric chart and its use together with a few specific problems and their answers are discussed in this issue with the purpose of familiarizing the reader with the operation of the chart.

By GEORGE G. BORDEN

IN previous articles of the series, reference has been made to the Psychrometric chart from time to time. In this article we plan to describe the use of the chart and work out a number of practical problems. Although this article may seem a little involved and quite technical, let us again reiterate that the man who will be most successful in servicing and repairing air conditioning equipment will be the one who is thoroughly grounded in its fundamentals. A good understanding of the chart is a necessary working tool of every successful air conditioning service engineer.

The Psychrometric Chart shows the relationship between dry bulb temperature, wet bulb temperature, dew point temperatures, and the relative humidity of air. If we know any two of the above factors we can find the other two from the chart. For instance, if we know the dry and wet bulb temperatures in a room, we can find out what the relative humidity is in the room and also what the dew point temperature is.

How to Use the Chart

On the Psychrometric Chart, the dry bulb temperature lines run vertically upward, the wet bulb temperature lines slant downward to the right from the curved line marked dew point or saturation temperature curve A, and the relative humidity lines curve upward from the lower left hand corner of the chart. The dew point temperature lines run horizontally across the chart and their values are read on the saturation curve.

As an example of how to read the chart, let us suppose that from our sling psychrometer, we found a dry bulb temperature

of 80 degrees and a wet bulb of 60 degrees. What would the relative humidity be? To find this we rise up vertically along the 80 degree dry bulb line until it intersects the slanting 60 degree wet bulb line. We find that this point of intersection also intersects the 30 percent relative humidity line. Hence, an 80 degree dry bulb, 60 degree wet bulb corresponds to a 30 percent relative humidity. As another example, consider a condition of 90 degree d.b., 75 degree w.b. Rising up the 90 degree d.b. line to the point where it intersects the 75 degree w.b. line we find the relative humidity to be 50 percent.

Finding the Dew Point

To find the dew point temperature, we merely find the intersection of the dry bulb and wet bulb temperature lines and go horizontally to the left of the sheet and read the dew point temperature on the saturation line.

For example air at 90 degree d.b., 75 degree w.b. has a dew point temperature of approximately 68 degrees. Air at 80 degree d.b., 60 degree w.b. has a dew point temperature of 45 degrees.

Now suppose we had air at 80 degree d.b. with a dew point temperature of 60 degrees, what would its wet bulb temperature and its relative humidity be?

To find the answer to this problem, we go up to 60 degrees on the dew point temperature line and go horizontally to the right until we intersect the 80 degree d.b. vertical line. Then at this point, we read off the relative humidity as 50 percent. From this point, we can move along the slanting wet bulb lines to read the wet bulb temperature as 67 degrees.

Suppose now we have air at 65 degree wet bulb and a dew point temperature of 55 degrees. What will the dry bulb temperature and the relative humidity be?

In this problem we locate 55 degrees on the saturation curve and then go to the right until we intersect the slanting 65 degree wet bulb line. At this intersection, we find the dry bulb temperature to be 84 degrees and the relative humidity to be 40 percent.

As a matter of practice, we should work out a few problems to become thoroughly familiar with the method of determining the various factors commonly used in air conditioning work. Fill in the blank spaces in the following table, then refer to the answers at the end of this article.

	Dry Bulb Temp. °F.	Wet Bulb Temp. °F.	Relative Humidity %	Dew Point
1	80	64		
2	85		50	
3	80			60
4		75	50	
5			45	65
6		78		70

You are probably wondering why a Service Engineer should know what the dew point temperature of the air in a space is. The customer may ask about the dry bulb temperature, but what good is the dew point temperature?

As you will recall, the dew point temperature is the temperature at which moisture starts to condense out of the air. It is necessary that this temperature be known so that cold water pipes and cold air ducts will not be exposed in spaces where the temperature of the duct or pipe will be below the dew point temperature. If either of these conduits is below the dew point temperature, moisture will condense out of the air onto them and this may spoil walls or floors. When cold pipes have to run through unconditioned spaces where the dew point temperature is likely to be high, they must be covered with sufficient insulation to prevent the formation of dew.

Total Heat in a Pound of Air

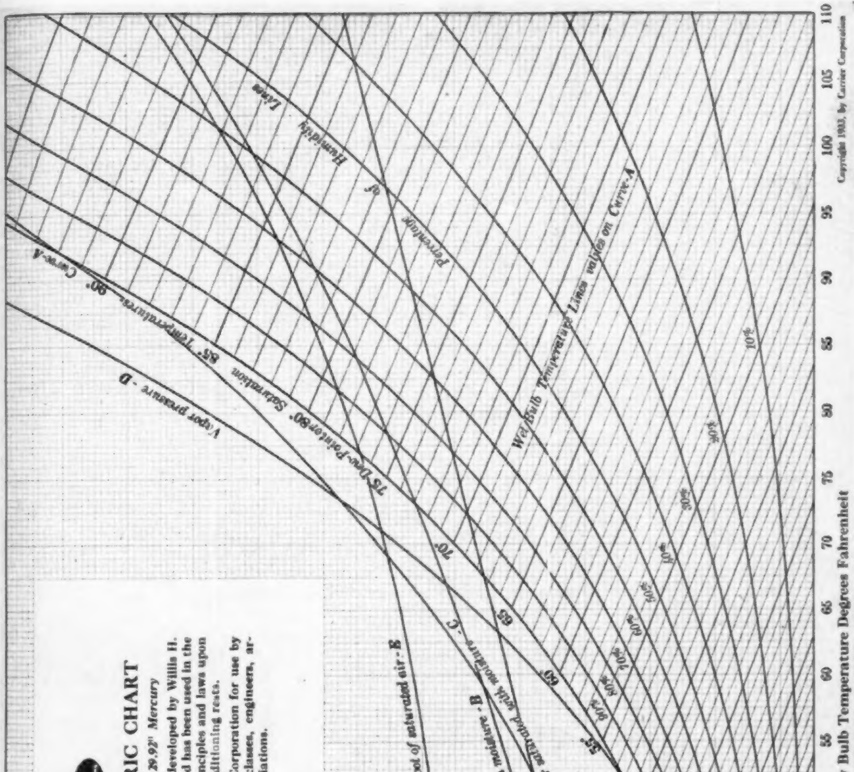
We have learned that the wet bulb temperature is a measure of the total heat content of the air. Just to refresh our memories, we know that in all air there is three kinds of heat:

1. Sensible Heat
2. Latent Heat
3. Total Heat

Sensible heat, is the kind of heat that affects the temperature of a substance. When air passes over a hot radiator, it absorbs sensible heat from the radiator and thus it becomes warm (its temperature rises).

Latent heat is the heat necessary to evaporate water (change it from a liquid into a gas). All air holds some moisture. The more moisture air holds, the greater amount of latent heat it must hold. For every pound of water vapor in the air, 1,050 B.t.u.'s must be added to that water.

Total heat is the sum of sensible heat and latent heat and the wet bulb temperature of the air is a measure of the total heat that the air contains. In order to find the total heat from the Psychrometric Chart, we need to know only the wet bulb temperature of the air.



PSYCHROMETRIC CHART
Barometric Pressure 29.92" Mercury
This Chart comprises data developed by Willis H. Carrier and his associates and has been used in the formulation of the basic principles and laws upon which the science of air conditioning rests.
It is published by Carrier Corporation for use by schools, colleges, training classes, engineers, architects and technical associations.
Grains of Moisture per lb. Dry Air - A
Cubic feet per lb. - B
Total Heat above Zero Degrees contained in one lb. Dry Air Saturated with Moisture - C
Vapor Pressure in inches of Mercury - D
Grains of Moisture per Cubic Foot of Saturated Air - E
Dry Bulb Temperature Degrees Fahrenheit
Wet Bulb Temperature Lines values on Curve-A
Percentage of Humidity Lines
75 Dew-Point or 80° Saturation 85° Temperatures 90° Curve-A
Vapor pressure - D
Grains of moisture per cubic foot of saturated air - E
Volume in cubic feet of one lb. dry air saturated with moisture - B
Volume in cubic feet of one lb. dry air - B
Total heat above zero degrees contained in one lb. dry air saturated with moisture - C
Copyright 1933, by Carrier Corporation

To find the total heat in a pound of air, we locate the wet bulb temperature line and run upward to the left until we come to the saturation line. From here we run vertically upward or downward until we intersect the total heat curve marked "C." From here we run horizontally leftward and read the total heat in a pound of air from the third column of figures at the left of the page. Let's work through several examples in order to learn to read the total heat directly from the Psychrometric Chart.

Let's take air at 70 degree d.b., 50 degree w.b. to find its total heat. Locate the 50 degree wet bulb line and follow it upward to the left until you intersect the saturation curve A. Then rise vertically from this curve to the total heat curve directly above. From here run horizontally to the left and read the total heat as 20 B.t.u. per lb., on the third column marked "Total Heat Above Zero Degrees."

As another example, take air at 65 degrees wet bulb. Rise vertically from the saturation line until you intersect the total heat curve above. Then move horizontally

To find the total heat in a pound of air, 29.5 B.t.u. per lb. of air.

To become thoroughly familiar with reading the total heat from the Psychrometric Chart, we should work out the following problems:

Wet Bulb Temperature	Total Heat B.t.u./lb.
50°	20
60°	26
67°	31
75°	38
80°	43
85°	48

As explained in last month's article, with the aid of a sling Psychrometer (dry and wet bulb thermometers) and an anemometer (air speed indicator), we can test the capacity of a machine if we know how to obtain the Total Heat from the Psychrometric Chart.

Here are the answers to the problems on the Psychrometric Chart.

1. 41% R.H. 53½° D.P.
2. 71° w.b. 64° D.P.
3. 67° w.b. 50% R.H.
4. 90° d.b. 50% R.H.
5. 89° d.b. 72¼° w.b.
6. 98° d.b. 40%.

The Diceler Radial Compressor

IN the last 20 years, the general design and appearance of the conventional piston type refrigeration compressor have changed but very little. The important elements, such as cylinder casting, crankshaft, connecting rod, piston, valves, condenser, motor and belt drive have retained their identity.

It is true recent years have seen several distinct trends in the design of rotary type compressors, but it has always been a recognized fact among refrigeration engineers that the piston type compressor affords the most efficient compressing means yet developed.

One of the most recently developed and perhaps the most interesting from the viewpoint of its compact design and new features is the "Diceler" radial four cylinder compressor.

Foreseeing the need of a more compact and efficient condensing unit, especially for domestic and light duty commercial applications, the company decided to completely redesign and modernize the piston type compressor, to incorporate the four cylinder radial design, with overlapping compression impulses and streamlined features which would distinguish this condensing unit from its ancestors.

In its present 1/6 hp. size this unit is designed for domestic refrigerators, water coolers and any small commercial application within its capacity. Because of the extremely severe conditions to which this type of equipment is subjected in service, much consideration and careful planning had to be given to each part and all potential sources of service troubles had to be eliminated.

Developing a compressor for this class of work calls for these essentials: performance, appearance, simplicity, durability, compactness, accessibility and cost. In designing the unit portrayed in Fig. 1 these factors have all been considered.

The complete motor and compressor assembly employs only one shaft, with two

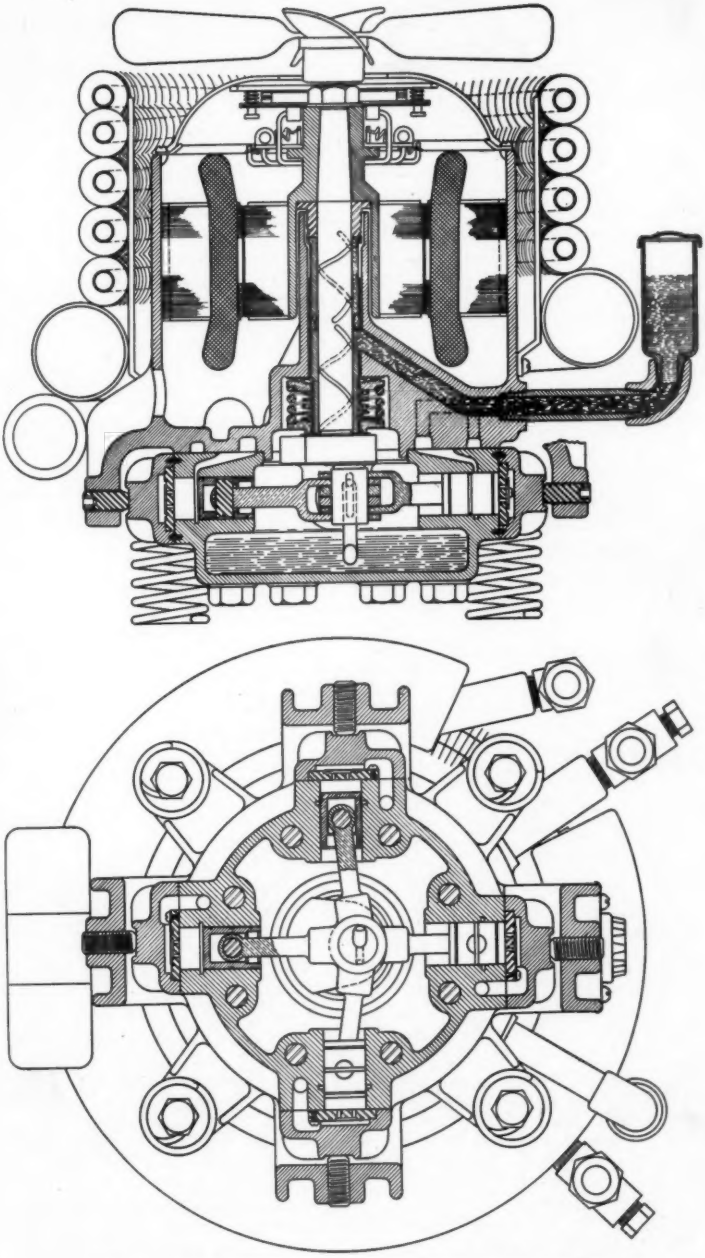


FIG. 2—CROSS SECTIONAL VIEW OF THE DICELER UNIT.

main bearings, which carries the rotor of the motor and provides a crank pin at the lower end to convert rotary motion of the shaft into reciprocating motion for the four small single acting, radially disposed pistons. While the shaft is turning 1725 r.p.m., on 60 cycle current, the actual piston speed is much less than the piston speed of the conventional belt driven compressor because of the short 7/16 stroke.

The compressor is not hermetically sealed, since the inverted motor which is directly connected to the compressor affords a new type of sealing system "Duolubriseal" which approaches the sealing effectiveness of the hermetically sealed unit, and actually seals against oil instead of refrigerant or air. It

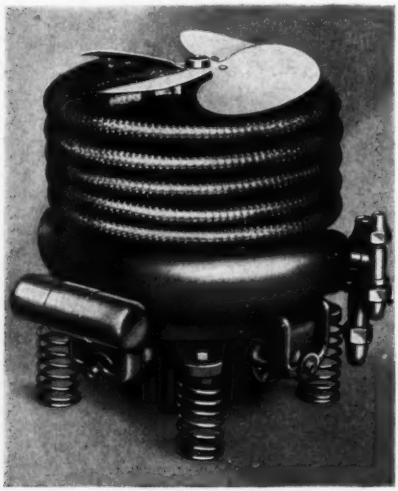


Fig. 1—The Diceler radial compressing unit which combines an open type unit with unusual compact design.

will be noted in Fig. 2 that there are two separate oiling systems. Referring to the motor oiling system, the oil reservoir, on the right hand side of the illustration, which communicates with the oil well around the motor shaft through an oil passage in the motor casting, is filled with a permanent supply of oil which keeps the two motor bearings and outside of seal face completely flooded with oil at all times. Referring to the compressor oiling system, the small oil tube "Rotoforce Oiler" seen on the end of the crank pin in Fig. 2, pumps oil, by circular motion of the shaft, from the lower oil reservoir or crankcase to the main connecting rod bearings and inside seal surfaces, resulting in forced feed lubrication of these important elements. Pistons and piston pins are lubricated with oil thrown by centrifugal force from the main connecting rod bearings. The oil charge in the compressor is 4 oz.

By keeping the motor winding separated from the compressor, motor heat is not introduced into the refrigerant, as in the hermetically sealed unit, and the motor parts may be repaired or replaced without dismantling the compressor. This design also allows the use of direct current motors where required. The shaft extension permits mounting of a fan on the motor compressor shaft to force air directly downward over

CAPACITIES RATED UNDER A.S.R.E. STANDARD CONDITIONS 90 DEG. F. CONDENSER AIR

Suction temp. ° F.	+26°*	+15°	+5°	—3°	—10°
Freon 12					
B.t.u. per hr.....	1,665	1,316	1,019	829	643
I.m.e. per 24 hrs..	279	219	170	137	114
Methyl Chloride					
B.t.u. per hr.....	1,435	1,175	910	740	575
I.m.e. per 24 hrs..	240	196	152	124	96

*** Special Condenser Required.**

the condenser fins and through the motor winding. A separate fan motor for condenser is not required.

The usual base plate of the unit has been entirely eliminated, the assembly being suspended on four mounting springs, attached to lugs cast integral with cylinder casting, to simplify installation, eliminate vibration and effect quieter operation.

Suction valves have been eliminated and are replaced with a new design of suction port, which extends entirely around the cylinder wall to insure taking in a full charge of gas on the suction stroke. This feature together with reduction of all compression clearances to absolute minimum insures the greatest volumetric efficiency.

A capacitor type motor with automatic overload protection has been built into the unit, for all alternating current applications, since this type of motor provides a strong starting torque and employs the simplest form of centrifugal switch to open the starting winding circuit.

The entire unit as shown in Fig. 1 is only 11 inches wide, 12 inches deep and 11½ inches high. Such compact design makes it particularly useful as a replacement unit for any of the hermetic units now on the market as well as for the usual conventional belt driven type.

SERVICE KINKS

Tools and Equipment You Can Build

Under this heading will appear simplified or short cut methods of performing individual service operations; also details of how you can build special tools and equipment for your own use. Readers are invited to submit information for publication under this head.

Pressure Test Unit

By GEO. H. CHRISTOPHEL
Elkhart, Ind.

IN servicing High Side Float equipment, I was unable to find any make of so-called purging and charging unit that was entirely satisfactory or convenient to use.

In the first place, the average unit must be laid on the floor, or attached to the compressor valve, or in other ways positioned so as to be both in the way and inconvenient to read. In the second place, I have never approved of charging and purging through the same passages.

An examination of Figs. 1 and 2 shows that my hook-up digresses from the usual test set, except for the by-pass valve between the high and low side manifolds. The by-pass is provided only in case it is necessary to discharge the head gauge back into the suction line, when it is not possible to purge it externally, or for the adjustment of low side controls.

Since we have lines of considerable length connecting the head gauge to the compressor under test, there may be sufficient liquid condensed in the line to upset the critical charge in the high side float system; thus, the advisability of purging the liquid in this

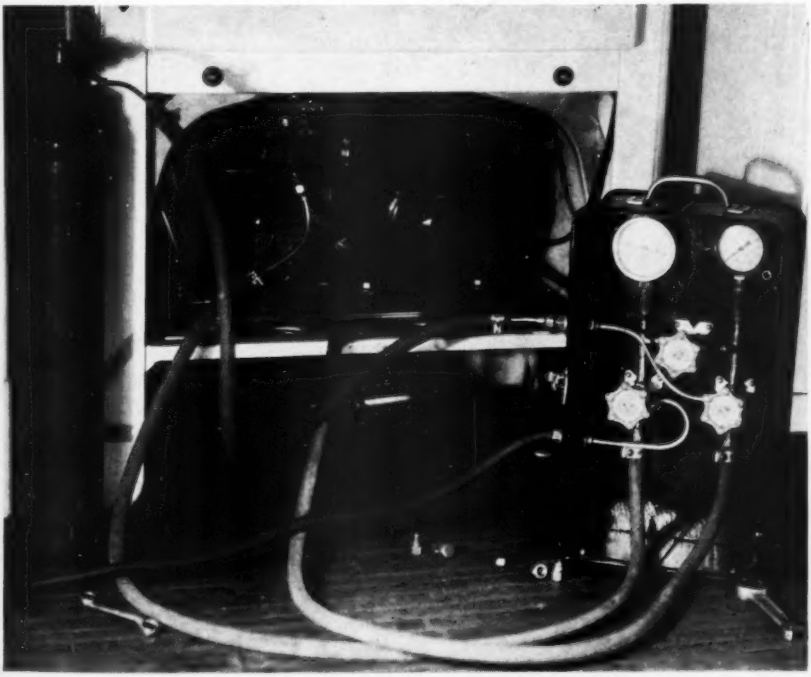


Fig. 1. A view of the charging unit connected while in use.

line externally. Even when using this gauge set to adjust low pressure controls, it is advisable to first purge the high side in case there may be some air or some non-condensable gases in the high side. I have found it wise with any type of gauge set to wash all tubes and manifolds monthly with carbon tetrachloride to remove oil and carbon deposits. Of course, in this instrument, the side ports are capped and the flexible lines plugged when the unit is not in use. Always purge all passages when a change in the type of refrigerant to be tested is made.

The flexible tubes, which are connected to the high and low side test manifolds, as well as the lines from the tank and for purging, are 5-foot lengths of high pressure acetylene hose, which combines extreme flexibility with strength. Inserted in the ends of the hose are 10-inch sections of ¼-inch soft copper line, with flare nuts attached at the end. Thus, as the flares wear out, the tubes can be gradually shortened and replaced when necessary.

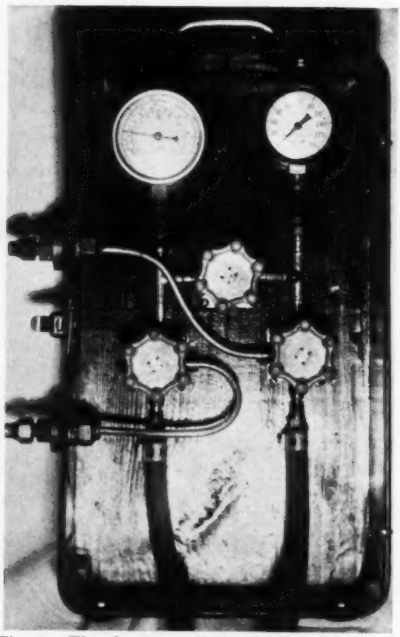


Fig. 2. The charging unit itself showing the construction and internal connections.

Inserted in each of the copper lines in the test unit, which lead to the gauges, is a streamlined three-way valve. The branch being connected to the lines leading to the acorn strainers at the side of the case. These strainers are provided to filter the liquid in charging operations, since I use a drier in adding gas to the larger Freon and methyl units.

The case is a metal cabinet removed from an old radio. The valves and gauge assemblies are fastened to a wooden base, which is securely screwed to the base of the cabinet. The low side gauge is one of the compound-type with temperature charts for sulphur, methyl and Freon. The high side gauge is a standard 300 lb. back recalibrator.

The convenience of this type of unit lies in the fact that it can be stood up on the floor near a household refrigerator, or suspended by the handle above a commercial installation for easy reading. In servicing either commercial or domestic units with high side floats, it enables the service man to obtain the correct refrigerant charge in the shortest possible time.

Using the Unit

When such a unit is to be checked, the procedure is as follows:

The flexible tubes are connected to the high and low side valves on the compressor, respectively. Then the lower side connection is attached through a hose to the charging drum, and the upper connection to the purging hose. These connections are the ones on the side of the test unit. I find that if gas is added until the suction line frosts to the compressor with a gauge reading of about four inches on sulphur and about seven lbs. on methyl, and then it is purged slowly until we have a vacuum of eight inches sulphur, or four lbs. methyl, with a coil temperature of from 10 to 15 degrees, with no frost on the suction line (at which time the compressor will have been stopped by the thermostat) the unit will have the correct charge within one ounce. This purging operation must be done very carefully, or too much refrigerant may be removed from the unit. Frequently, after changing a seal, which was leaking badly, air will be found in the system. This will show up as high head pressure as soon as the charging operation is started. This air is easily removed without changing any connections, as is necessary with conventional-type charging units.

Sometimes with the 1936 or 1937 Kelvinators, which have the float mounted on the back of the cabinet near the evaporator, a job which is extremely short of refrigerant will force air up into this float chamber,

which will air bind it shut. In this case, it is a very simple operation to connect the low side port on the instrument case to the two-way valve on top of the receiver, and pump 25 to 27 inches of vacuum on this entire portion of the system. The compressor head valve being screwed all the way in, the air is discharged to the outside. Then, when the tube is to be transferred back to the low side again, it is also discharged through the instrument and the charging operation may be resumed.

Such a test unit, which brings shop analysis into the field, is fully worth the few hours of the service man's time required to build it.

Leak Detector

By JACK JOSEPHSON
Josephson's Elec. Refrig. Serv.
Bridgeport, Conn.

THE method of using a tube submerged in oil as a means of determining when a compressor is completely evacuated or of determining whether the seal leaks, has been

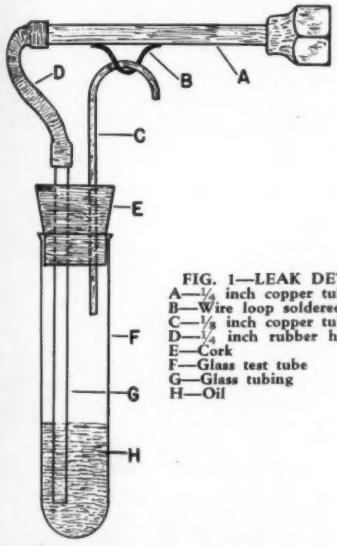


FIG. 1—LEAK DETECTOR
A—1/4 inch copper tube
B—Wire loop soldered to tube
C—1/8 inch copper tube vent
D—1/4 inch rubber hose
E—Cork
F—Glass test tube
G—Glass tubing
H—Oil

used quite commonly by most service engineers.

This little device (Fig. 1) provides a permanent test tool which may be conveniently carried in the tool kit if desired. The method of using, of course, is the same as mentioned above, with the addition of one other test that can be made.

Connect the tube (A) to the discharge side of the compressor so that all the air, gas, etc., pumped from the compressor must pass through the glass tube (G) and the oil (H). Close off the suction side of the compressor. For compressors just overhauled, run for about 20 minutes on vacuum. If at the end of this time bubbles still appear in the oil at (H) there is a leak in the crankcase. If after tightening all bolts and eliminating all sources of leaks the bubbles still appear, the compressor seal is leaking.

This method may also be used in the field to test for leaks on either the compressor or the entire system. Remember, however, that the compressor oil may contain some refrigerant which will require a longer running time to remove and before bubbling in the test tube will stop.

To test for leaky discharge valves, connect as in other tests, run the compressor until a good vacuum is secured; then stop the compressor and observe the glass tube (G). If oil begins to rise in this tube it indicates a leaky discharge valve.

Capacitor Starter

By JOHN R. PAYNE
Los Angeles, Calif.

THIS service tool is one of the handiest I have ever used. It consists simply of a 110-volt mfd. condenser, a doorbell push button, three clip leads and some wire. Figure 1 shows how to hook it up.

The uses are mainly to start capacitor-type units, such as General Electric, Westinghouse, Majestic and others. If the ma-

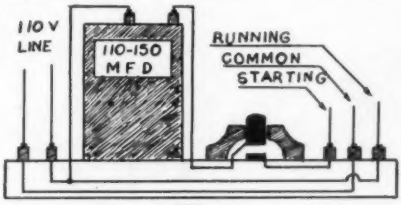


FIG. 1

chine has stuck, it may be started many times by simply reversing the starting and running leads, and pressing the button several times. This tends to make the machine run in the opposite direction. If that does not jar them loose, leave the leads reversed and try 220-volts.

To check a job to see if the trouble may be in the switch or condenser, just hook the three leads up as they should be and press the button a second, and then release.

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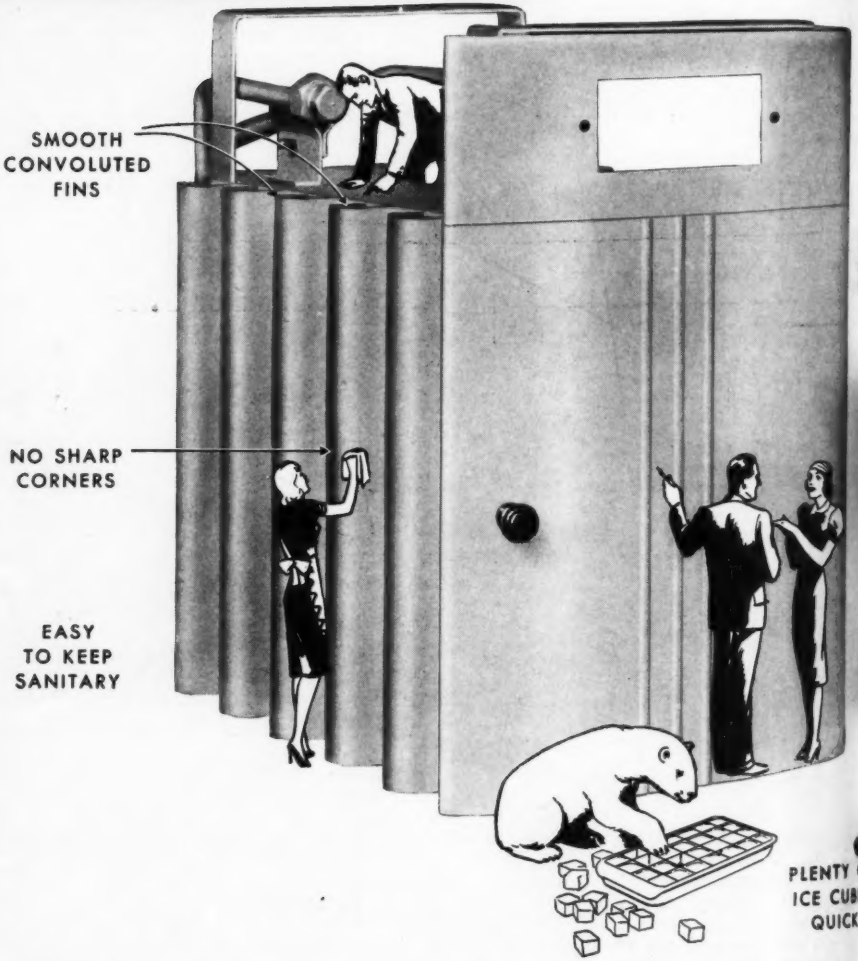
because it's easy to keep clean!



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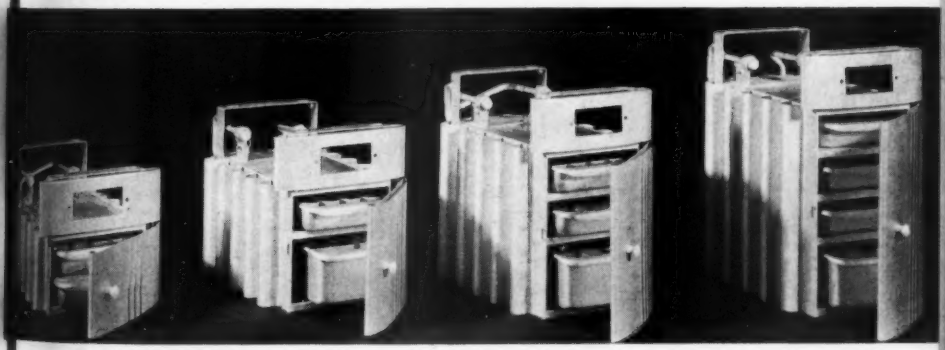
Also modern appearance . . . silver-satin finish . . . quick easy installation for standard equipment or replacement,—all combine to make Fedders 1939 cabinet cooling and ice cube making evaporators the best buy in the refrigeration industry. Built in 2, 3, 4 and 5 tray sizes, they provide a beauty treatment for refrigerator interiors. Arranged for top or bottom feed with Fedders expansion valves, they make a complete economical low side. Write for specifications and prices.



Showing complete line of Fedders new 2, 3, 4 and 5 tray Household Evaporators for cabinet cooling and ice cube making.

Fedders complete line includes Finned and Plain Tube Coils, Standard and Low Temperature Unit Coolers, Evaporators, Condensers, Valves, Oil Separators, Heat Exchangers, High Side Floats, Air Conditioning Units and Coils.

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Dehydrating Unit

By R. H. DINSMOOR
El Monte, Calif.

A HOMEMADE device to discharge and dehydrate units and coils, which we have been using for the past two years and find very useful is shown in Fig. 1. We find it a sure way to tell when moisture is out of a system you are overhauling.

It consists of a sheet metal oven, vacuum pump, instrument board, two Mason jars and a few hand valves, taken off of old jobs that have been replaced by new equipment.

For a vacuum pump, we chose an old Belding-Hall unit, as they are gear pumps and the only pump that will not freeze up with moisture, and there are no valves and valve plates to rust out. The oven is made from an old metal brine tank about three feet wide, three and one-half feet deep and four feet high, stood on hand. We used a piece of old sheet iron for a door, and two hinges from an old cabinet and an improvised catch.

We used a burner from a gas range, and also have a Lorraine oven control to control oven heat.

The object of the bottles or fruit jars is the most important part. Fruit jar (D) is

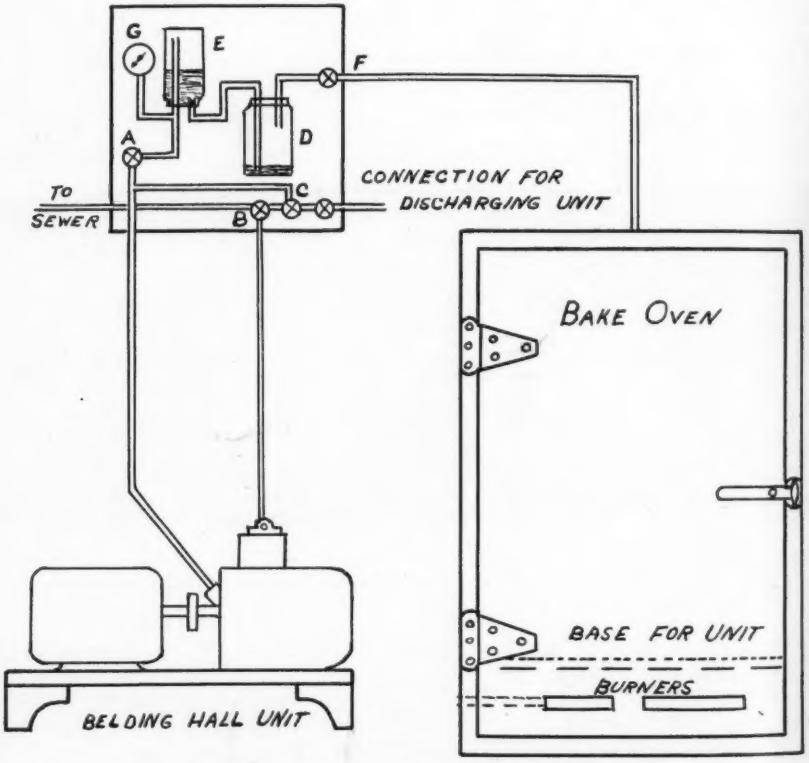

FIG. 1.—DEHYDRATING EQUIPMENT
A, B, C and F are hand wheel valves. D and E are sealed fruit jars, G is a compound gauge

not necessary; only as a safety device to collect oil from leaving jar (E) in case the check valve should leak after stopping vacuum pump, and the vacuum in the unit or coil should draw the oil out of jar (E).

In the oven above burner, a sheet iron base with holes should be installed to hold unit, and protect the flame from coming in contact with condensing unit or coils you are baking out. Cut a hole in the oven near top to allow ¼-inch tubing to go through to connect to head valve on compressor or suction valve on coil. A hand valve should be installed between the fruit jar and oven.

Jar (E) should be about half full of oil so during the dehydrating, you will see bubbles rise up through the oil. This shows you are removing moisture from equipment in the oven. Providing you do not have any leaks, when the bubbles stop, the equipment is free from moisture. We heat the oven to 225 degrees. By means of other hand valves you can discharge units, coils or purge system direct into sewer, or when the pressure is gone, by closing hand valve A and opening valve C and having valve B in proper position, draw a vacuum with the pump. We find by using this equipment as explained, there need be very little SO_2 fumes in the shop.

? ?

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box."

? ?

CLEANING ALUMINUM TRAYS

QUESTION 320. What is the best method of cleaning discolored or dirty aluminum ice cube trays which are not easy to clean?

ANSWER: Aluminum and tinned copper ice cube trays and grids may be cleaned and restored to their original appearance by the following method:

Secure three containers, each of about 3 gallons capacity, two of which should be preferably stone crocks. In one mix a solution of lye and water, using ½ lb. of lye to each gallon of water. Fill the second crock with common household vinegar. Place the third container in a nearby sink, and use for a running water rinse.

Place the trays or grids to be cleaned in the lye solution. The handles may or may not be removed. Let these remain in the solution until the lye has had time to dissolve discoloration on surface of the tray or grid. In most instances, this will be about 15 minutes after the boiling action has been noted around the edges of the part to be cleaned. Use rubber gloves or pliers to remove the tray from the lye solution, and rinse it off in the running water container. Then, immediately drop it into the container of vinegar. The vinegar will neutralize the effect of the lye, and will arrest any further chemical action on the part cleaned. After an immersion of about 10 minutes in the vinegar rinse, the tray or grid should be put again into the container of running water.

On badly discolored parts, it will be found necessary at times to brush them after the lye solution immersion, holding the parts under the running water. A stiff tooth brush serves this purpose very well.

RECHARGING CONTROL BELLOWS

QUESTION 321. Can you please give me information on recharging the power bellows on domestic controls? What I should most like to know is: What is the charging pressure for SO_2 or methyl chloride for the various room temperatures?

ANSWER: There never has been any information released on recharging of thermostats, and we have no information here with which to supply you.

This is a rather difficult job to do outside of the factory where the control is made, and requires considerable equipment, which the average service shop does not have.

I don't believe the charging pressure would have any bearing on the matter at all. It is primarily a matter of the quantity of refrigerant to be charged into the bellows

and the knowledge of what refrigerant is used. I believe there are probably ten or twelve different gases, depending on the construction and application of the particular control.

I believe if you attempt this, you will find the job is far more expensive than it is worth and that the purchase of replacement bellows will be of greater value to you.

LOCATING LEAKS

QUESTION 322. I have a couple of Freon (F12) jobs which have refrigerant leaks that I cannot locate. I've tried every kind of torch I ever heard of, but still no luck, and others have tried before me.

I would like to know if there is any tracer that might be put in the refrigerant to help in locating these leaks. Would it be safe to completely discharge the system, put in a shot of SO_2 and then after finding the leak recharge with Freon? These are air conditioning jobs; five tons.

ANSWER: There are several means through which you may locate the leaks in a Freon system.

First, oil of peppermint may be added as a tracer, which will merely act as a detecting odor in case of a leak. This, however, may not be sufficient in the case of very small leaks.

Second, the system may be completely discharged, and a small amount of sulphur dioxide purged into the system for the purpose of locating leaks, providing the system is dry so no harm will be done to it with the contact of SO_2. Here, again, I am doubtful in the case of very small leaks that cannot be detected with a torch if they would show up with SO_2 due to the fact that you would have a much lower pressure, and that SO_2 has a higher specific gravity, and will not pass through such a small opening as Freon.

The third method would be to completely discharge the system and exert a pressure of about 250 lbs. per square inch, using CO_2 as a pressure medium, and then test all joints with soap and water.

The fourth method, which I have heard of recently, and with which the user claims great success, is that of using a stethoscope in examining all connections. This particu-

lar user claims that all leaks, no matter how small, will be accompanied by a slight hissing noise, and the stethoscope will pick up this sound where it is impossible for the human ear to do so.

HOW MUCH OIL? CHECKING HEAD PRESSURE. AMBIENT TEMPERATURE

Question 323. When overhauling a reciprocating type compressor—because of so many models—is it all right to fill crankcase with oil to center of crankshaft, or where should the oil level usually be maintained? I realize there are given amounts of oil for nearly every make, but this is not always possible to determine. Is this a safe practice to follow? I have had the experience that surplus oil will usually pump its way out when the compressor is pumped to, say, 27 inches vacuum. Is this correct?

Is the theory correct that sulphur will carry with it about 10% of its own weight in oil and be returned to the compressor? I have seen, and heard it said, that oil should be added to a low side float of a domestic refrigerator after repairs, say on a 7 cubic foot box. If this holds true, a certain amount must be added to commercial jobs also, and an incorrect amount may be added. I have always figured that the idea was to keep the floats or low side floats on any evaporator clear of any oil. Is this correct?

When checking head pressures of domestic condensing units, where should the thermometer be placed? It appears to me the temperature should be taken after the system is operating normally.

When installing a domestic condensing unit, usually in a basement, with the refrigerator located on the first floor about 25 feet above the unit, to about what temperatures should the surrounding air be allowed to drop where the condensing unit is operating? My idea is that the machine will operate satisfactorily providing the temperature is a little higher than the temperature of the gas returning to the compressor, to prevent it from condensing on the way to the compressor. Is this theory okeh?

Answer: I don't believe that you can rely on using a fixed oil level for all compressors, such as you have mentioned.

While it is true that a compressor will very often pump out a certain amount of excess oil on the first vacuum test, I don't believe you can rely on them adjusting the

oil level to what it should contain. Some compressors are designed to carry a comparatively high level, while others will carry just sufficient so that the cranks will dip into the oil.

The amount of oil specified by manufacturers often is the amount required in the compressor, plus the amount which will circulate through the system, or be contained in the low side float. In practically all low side floats using sulphur dioxide as the refrigerant, a light blanket of oil is carried. It is advisable, of course, that this blanket should not be too heavy, but it is practically impossible to eliminate it entirely. If you will refer to the oil data specified by some refrigerator manufacturers, you will find that they specify a certain number of ounces of oil to be placed in the compressor and a certain amount to be placed in the low side float. I believe you will be much safer in referring to the oil and refrigerant data, such as contained in the June, July and August, 1937, issues of THE REFRIGERATION SERVICE ENGINEER, or to manuals supplied by the individual manufacturers.

When you mention checking the head pressures of domestic condensing units with a thermometer, I take it for granted you are speaking of hermetically-sealed units. It is difficult to get a true temperature reading on condensers due to the fact that it is not possible to get a perfect contact between the condenser and the thermometer. I believe, though, you will get fairly good results if you can arrange to form a cup out of clay around the first or second top tubes of the condenser, and fill the cup with water or oil, and insert the thermometer in it. Time, of course, will have to be allowed to permit the water to warm up to the condenser temperature before taking a reading.

While I believe your theory in connection with determining the minimum ambient temperature for remote installations would be satisfactory insofar as overcoming the trouble of gas condensing in the return line, I am not sure that this would work out when taking other troubles into consideration. In the first place, I believe it would be difficult to determine what the return gas temperature is since the ambient temperature, and the temperature of the return line, will have considerable bearing on the temperature of the return gas.

As a usual thing, refrigerators controlled by a thermostat will operate satisfactorily on temperatures as low as 50°, taking it for

granted, of course, if the system is of the high side float type that the float is installed with the condensing unit, and that the rise between the unit and the refrigerator is not over 25 feet. Machines controlled by the pressure switch in some cases may give trouble on temperatures below 55 or 60°. The trouble will usually be indicated by short-cycling.

DISPLAY CASES

Question 324. One of my customers has a 12-foot top display case. This case is not very good for temperature due to the coil, I believe. It has one coil just below the doors; the coil is four inches square, with four tubes about ten feet long. He wanted me to hang this coil in the top of the case. I told him this was not practical because of the size coil and the position of his doors.

I suggested two new coils—an off-center coil located at the top, one inch high, 5½ inches wide and 127 inches long; also a bare pipe coil 126 inches long and 12 tubes wide. Do you think these coils will do a good job? Would you raise the bare pipe coil off the bottom of the case and, if so, how high? How much room should there be between the top of the case and the off-center coil?

Also, is it possible to buy service manuals on the following machines: Kehr, Frigidaire, Lipman, etc.?

Answer: Most certainly your suggested changes to this top display case will create an improvement.

Apparently, the new coil you propose installing will have less square feet of surface than the coil being used at present. However, this difference may be off-set sufficiently by the increased circulation you will obtain with the new coil to provide satisfactory refrigeration.

The addition of a bare pipe coil at the bottom of the case will certainly be of value, and I would suggest that this be raised from the bottom of the case, and be placed nearer to the shelves on which the pans rest. The coil at the top of the case should be, if possible, about four inches from the top. However, I take it for granted that there is not this much space available, and you will probably have to allow about two inches from the top.

In installing, I would suggest that the drain pan be placed in such a manner that a warm air chute will be created up the front of the show case, and the cold air will return down the back of the case. This can be done by tilting the drain pan so the lowest part is toward the back of the case. An illustration of this is shown in Question 283 in the October, 1938, issue.

I don't know of any place where you may purchase service manuals on those particular machines. Usually, they are not for sale, and if available at all, there is no charge for them. I would suggest that you write the manufacturers direct for them.

SOLDERING STEEL EVAPORATORS

QUESTION 325: I have a coil off a G.E. unit which I have been trying to silver solder. I believe it is of stainless steel. Every time I solder it in one place it cracks at another. Do you know of a way to repair it?

ANSWER: I believe your difficulty in endeavoring to solder the General Electric stainless steel evaporator is due to the high heat required in using silver solder.

The excessive local expansion and contraction after cooling causes the new cracks to appear. I would suggest that you secure a kit of the Imperial All-Metal Solder and Flux, which I believe can be obtained from your local jobber, and which melts at a much lower temperature than silver solder. This is a new solder that was recently developed for just such repairs, and I believe you will have more success with it than the silver solder you are using.

Further Aids

As an additional precaution, I would suggest that the entire evaporator be warmed to possibly 200 to 250 degrees before the soldering is started. This, I think, will possibly overcome the excessive expansion and contraction at the point of repair, tending to even out the expansion throughout the entire evaporator, and thus preventing cracking while cooling.

CROSLEY BEVERAGE COOLER

QUESTION 326: In Crosley beverage coolers I understand they have capillary tubing which is used instead of a high-side float, low-side float, thermal or automatic expansion valve. There is no liquid receiver on the condensing unit. There is something at one end of the condenser that appears to be a Fedders liquid line filter and from there on only the small tube to the coils. As near as I can figure out this system works a lot like a high-side float. When over-charging you get a frost line way back to the compressor and poor refrigeration. With a shortage of gas only part of the coil frosts up. If there is no check between high side and low side how would the pressure stay out of the low side when all the liquid is in the coils?

ANSWER: Capillary tubes constitute a restriction between the high and low sides of the system, but at no time completely shut off the flow of refrigerant between the two.

A capillary tube is designed with such length and diameter so that the flow of vapor through it is somewhat less than the amount of vapor that will be pumped by the compressor into the condenser. In this manner, the pressure in the condenser will gradually build up until it reaches the condensing point and liquid begins to accumulate.

You are perfectly right in that the capillary tube system contains no receiver. The gas passes directly from the condenser through a filter, which is located at the bottom of the condenser through the capillary tube into the evaporator. Nearly all the liquid refrigerant is contained in the evaporator at all times. Due to the fact that the capillary tube does not at any time completely shut off the flow of gas, as soon as the machine has stopped on its off-cycle, liquid and vapor gas from the high side will leak over to the low side until the pressure is equalized between the evaporator and condenser.

Charging of the system is much like the high side float in that it contains a critical charge, which must be perfectly balanced. As in the high side float system, refrigerant should be added until frost appears on the return line, which indicates a fully charged system. Sufficient gas should be bled off until the frost on the return line comes to a point within two inches approximately from the evaporator.

Complete service information on the Crosley refrigerating units is contained in the July and August, 1938 issues of THE RE-

FRIGERATION SERVICE ENGINEER. I would suggest that you refer to these issues, which I believe will give you a much better understanding of the Crosley unit.

RECLAIMING REFRIGERANTS

QUESTION 327: I believe a helpful piece of equipment for the service shop would be one or more large glass jars or carboys such as used for holding acid,—these to be used as containers for refrigerants. The regular cylinders are quite all right for fresh refrigerant but it often happens that a service man will want to clean out a machine and I think it a poor idea to blow the refrigerant out into the air and waste it. Two of these carboys could be connected up to form a distiller and reclaim all refrigerant. The container being glass, one could see the refrigerant inside and easily tell how much sediment, etc., it contained. Let me know what you think of this idea. It is one I have been toying with for some time.

ANSWER: I am afraid in the use of such a system, you would be subjecting yourself to considerable danger in that glass jars or carboys are not built with sufficient strength to withstand the pressures found in refrigerants. It would possibly be okay as long as the room temperature was sufficiently low to keep this pressure down below 5 lbs., but even at that, I would not rely on their strength to any extent.

In the warmer weather, there is a great possibility that the jar would explode, due to the pressure of the refrigerant.

Further than this, I am not sure that the idea of trying to save old refrigerants and redistill them is of much value. The amount of money to be saved would not be worth the probable trouble you would encounter. Reclaiming refrigerants is not as easy as it may appear, because it is not very easy to be sure of getting all the moisture and acids out of old refrigerants. Using a contaminated gas on a system at a later date may cause you considerable trouble.

\$ \$ \$

Frank Gianonatti
New York

I have been a subscriber to your magazine since March, 1936, and have found your magazine to be very helpful.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

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CHAPTER DIRECTORY—*Continued*

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TWIN CITIES CHAPTER, MINNESOTA: Meets 2nd Tuesday at Midway Y. M. C. A. President, Wm. Warner; Secretary, W. E. Gleb, P. O. Box 3332, St. Paul, Minn.

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On to Chicago

6th Convention, Jan. 15-18

ALL conventions of the R. S. E. S. have been important milestones in the advancement of the installation and servicing industry. With its increased growth each year and progress made in the educational work of its local chapters, plans are progressing for the largest convention yet held.

Providing for an unexcelled educational program, which will include many interesting innovations, the convention will be held in conjunction with the largest exhibit of refrigeration equipment and accessories ever assembled under one roof.

It will be the outstanding refrigeration meeting in the industry. Every service engineer should make plans to be present in Chicago January 15th to 18th.

Recent reports indicate that every available foot of exhibit space will be reserved far in advance of the convention dates. Many associations are planning their meetings in conjunction with the All Industry Exhibit.

Chapter Notes

Under this heading will appear news of the chapter meetings. For names of the officers and dates of regular meeting nights, please refer to the Chapter Directory.

DAYTON CHAPTER

July 21st—The meeting was called to order with a full complement of officers, and the minutes of the last meeting were accepted as read.

On the educational program for the evening Mr. Bob Cook of Ranco, Inc., presented a very educational demonstration of the Ranco line of controls. The demonstration was much enjoyed by those present.

TWIN CITIES CHAPTER

July 11th—The meeting got under way with President Wm. Warner presiding, and the usual reports of committees were received and acted upon.

Under the heading of good and welfare of the organization, Mr. A. E. Johansen stated that in browsing through the classi-

fied sections of the telephone directory in another part of the country he noticed the heading of a refrigeration service men's organization and below it a list of members who, according to the statement in the heading, were recommended whenever refrigeration service was required. Mr. Johansen thought that such a plan could be worked out among the Society members which would benefit both the Society and the individuals. Mr. Johansen was appointed as a committee of one to make investigations in regard to such a plan.

The Secretary was instructed to complete arrangements with Mr. George H. Clark for a proposed visit by him to the chapter sometime during October or November.

On the educational program for the evening, President Warner conducted a Quiz Contest, which was found to be both educational and amusing to those present. Three prizes were awarded on the following scores: L. A. Kreckow, 30; A. E. Johansen, 85; W. E. Gleb, 152.

MISSOURI VALLEY CHAPTER

April 6th—Guests of the evening introduced by Mr. Jones, chairman of the Educational Committee, were Mr. Robert Price, staff reporter, and Mr. Phil Redeker, managing editor of Air Conditioning and Refrigeration News. After these introductions and a few remarks by Mr. Redeker, the business session of the evening got under way with the reading of the minutes.

Several new applications for membership were presented and acted upon by the chapter and one new member accepted to active membership.

April 20th—Upon opening the meeting, President F. C. Haeberlein immediately turned it over to Mr. A. Jones, chairman of the Educational Committee.

Mr. Jones introduced Mr. Joseph Page and Mr. Bud McKee of the Detroit Lubricator Co., who proceeded with the showing of a moving picture on expansion valves, controls and solenoid valves. After this showing Mr. McKee explained the Detroit Lubricator Co.'s new high pressure cut-in and cut-out control and answered many questions and directed an interesting discussion on controls and their application.

The business meeting then got under way with the usual reports and routine.

Among these reports, Mr. Jones gave a

very complete outline of the progress made so far by the Code Committee. He gave a resumé of his interview with Mr. Brown of the City Building Commission and stated that following the coming election the licensing section of the suggested code would be presented to the City Council.

MADISON CHAPTER

June 13th—The meeting was called to order by President Phil Noth, the usual routine of business occupying the first part of the evening.

During a discussion of future activities a picnic was suggested by the President and arrangements were immediately begun. In choosing a place to hold the picnic it was suggested that a place be selected where swimming was available. The committee appointed by President Noth to handle the arrangements consists of G. Poster, K. Spilde and A. Janeck.

The educational program for the evening consisted of a Quiz Contest, which ended in a tie between the two teams; however, much entertainment was derived from the contest and was thoroughly enjoyed by all.

Due to the fact that the Capital Hotel had no available space for that evening the meeting was held at the Refrigeration Specialty Co., and thanks were extended to Bill Penewell for providing this space.

LONG BEACH CHAPTER

July 6th—The meeting was held at the offices of the Willis Refrigeration Co. in Long Beach and was presided over by President H. F. Voepel. The minutes of the previous meeting were read and approved and new applications for membership presented to the chapter.

Mr. Voorhis brought up the subject of the city license fee and it was voted that a committee of three be appointed to investigate the matter.

Committees to carry on the activities of the chapter for the ensuing year were appointed by President Voepel as follows: *Educational and Publicity Committee:* E. Brown, chairman, D. Voorhis and E. Gunsauls; *Membership and Investigating:* E. Langston, G. L. Holmes, L. Wendell; *Finance:* H. M. Thompson, L. K. Willis and L. S. Gould.

The educational program of the evening was supplied by Mr. Crofoot of Allied Refrigeration, who provided the entertainment and refreshments for the chapter and introduced Mr. Witt and Mr. Bretog of Peerless of America. These two gentlemen gave an interesting talk and presented a three-reel picture on Peerless coils and valves. One of the pictures was in technicolor and another showed the machine which cuts the Thermak coils. Samples of the company's products were on hand for demonstration purposes and many questions were answered on their construction.

ILLINOIS VALLEY CHAPTER

June —The meeting was held in the Jefferson Hotel with quite a large attendance on hand.

By way of entertainment and an educational feature, Peerless of America presented a splendid showing of their products, and after the meeting was over Mr. M. W. Knight showed several lengths of film taken on his vacation trip through Mexico, which proved to be very interesting.

Announcement was made that at the next meeting Mr. Herman Goldberg would be presented to show some of the various pictures he has taken of chapter activities throughout the country.

MONUMENTAL CHAPTER

July 12th—This meeting was devoted primarily to the presentation of the chapter charter.

Mr. C. A. Brunton, national president, was present for the occasion and after being introduced gave a very fine talk on the advantages offered by the Society to its members.

Following the talk, Mr. Brunton proceeded with administering the oath of membership to the members present and finally closed with the presentaion of the chapter's charter.

Membership cards and certificates were distributed to the members, and the business of the evening got under way. Among other things, it was decided to immediately have the charter framed.

Later on in the evening Mr. Brunton was again called upon to explain to the group the motives of the inception of the Society and to give a brief outline of its history. Mr. Brunton did so, going back to the year

1933 when the first chapter was formed and its total membership numbered 23, progressing until the present date with its greatly increased membership.

MONTGOMERY CHAPTER

June 15th—During the rush season the chapter is finding difficulty in getting sufficient men to attend to produce satisfactory meetings and due to the small attendance at this meeting it was devoted primarily to social entertainment.

Mr. M. Howard served refreshments to those present and an enjoyable time was had.

June 29th—The meeting was held at Mr. Milo B. Howard's place of business with a small number of members present.

A lengthy discussion was conducted on ways and means of producing better attendance at future meetings. It was brought out, however, that the hot weather and rush of work during this season was the real reason for members not attending.

MILE HIGH CHAPTER

June—To wind up the activities for the year for the chapter, a very successful picnic was arranged by a picnic committee which was composed of E. Martin, J. O'Connell and A. C. Darby and was held at Filius Park, a park in the mountains some thirty-five miles from Denver. Seventy-four attended the picnic and all enjoyed basket lunches and refreshments such as ice cream and beer which was furnished by friends of the Society.

Ball games and races were held in the afternoon, and prizes were given for all of the events. Much credit is due to the committee for arranging such a splendid picnic and it was due to their efforts that so many attended.

This picnic concluded the activities for the fiscal year, and the next regular meeting will be held in September, at which time it is expected to map out a program of educational features and also have a bowling team and other entertainment programs for the coming year.

A GROUP OF MALE AND FEMALE FISH EATERS

This interesting species which is a branch of the human family, have the peculiar characteristic of spending hours at a time eating fish. The occasion of this particular gathering was one of those joint get togethers of the R.S.E.S. Tri-State Chapter and their Ladies Auxiliary.

TRI-STATE LADIES' AUXILIARY

THE Ladies' Auxiliary and the men of the Tri-State Chapter held their July meeting with a picnic dinner at Armoco Park.

A large crowd attended, as invitations had been sent to all members, and all reported they had had a very enjoyable time.

Another similar dinner will be held at the same park for the August meeting.

SERVICE UNIT BOTH ATTRACTIVE AND ECONOMICAL

THE service unit pictured on the front cover is being used by the A. B. C. Repair Shop in Dallas, Texas, mainly for domestic refrigerator service.

The motorcycle is a four-cylinder Indian, and averages thirty miles per gallon of gasoline in city traffic, pulling the side car. The open top box in front carries refrigerant drums and tool box, with enough room to carry a condensing unit when necessary.

The refrigerator cabinet is an old Majestic with the insulation and food liner removed. The condensing unit space has been floored and partitioned off for carrying fittings and parts. Inside the cabinet proper there are belt racks, hangers for purge hose, extension light and holders for oil, Prestolite tank, etc.

"We have been using this unit for only about two months," states Mr. J. W. Parker, manager of the company, "but are more than pleased with its performance. If it had no other value it would be worth its cost in advertising."

NEW CATALOGS AND BULLETINS

RANCO INC., COLUMBUS, OHIO, have issued a descriptive bulletin No. 788 describing the function of their new "two temperature" 91G2 control.

For the first time in the history of commercial refrigeration, it is claimed, it is now possible, with a single two-temperature control unit, to constantly maintain high relative humidity and balanced control of coil and fixture air temperatures!

The simple, Ranco Control unit cuts in only when the coil is defrosted and cuts out only when the refrigeration requirements in the fixture are satisfied. The operating differential varies with each slight change of conditions to provide the exact amount of required refrigeration!

It insures automatic defrosting and constant fixture temperatures regardless of weather or load conditions for walk-in coolers, refrigerated display cases, ice cream coolers and many other applications.

By providing a single low-priced unit, Ranco revolutionizes food storage methods! Ranco Type 91G2 absolutely maintains

proper fixture-air temperature—and assures defrosting of the coil under all load and weather conditions. By providing adequate air circulation through frequent cycling—even during light load periods—humidity conditions are greatly improved. An adjustment knob on the outside of the control provides accessible means for the merchant to make a limited adjustment of the fixture temperature without affecting the defrosting of the coil.

The Harry Alter Company present their latest catalog with the following statement:

"Issue No. 128 is the third edition in 1939. This frequency of publishing our catalog enables us to present all new items and improvements at the time they occur. It also makes it possible to give our customers the latest information in respect to prices. This is the largest book we have ever published containing 144 pages and cover, with a special insert on colored paper. Many new items were added such as, new Ranco controls, Imperial Charging line and valve kit, valves complete with Zenith filters, larger size Fedders oil separators, 1½ and 2 h.p. Chieftain Compressors, additional sizes in Dayton belts, the new liquid line tap, etc. No effort has been spared to present all merchandise in a most complete manner as to description and application."

Imperial Brass Manufacturing Co., 1200 W. Harrison St., Chicago, Ill., has just issued a new 24-page catalog, showing the complete line of Imperial oxy-acetylene and oxy-hydrogen welding, cutting, brazing and lead-burning equipment, soldering equipment, gas and air torches and welding supplies.

Among the items shown for the first time in this catalog are a new universal welding torch with improved cooling design, new regulators, three soldering outfits and a paint burning outfit.

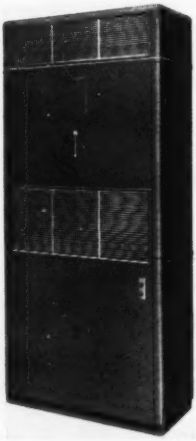
Supplies shown include a wide range of gauges, regulator adapters, hose, hose connections and clamps, goggles, flux, spark lighter, cylinder trucks, solder, etc.

Explained in the back of the catalog are the trade-in allowances which are given to customers who trade-in their old worn equipment on new Imperial apparatus.

Copies of this new catalog (No. 334) can be obtained by writing to the manufacturer.

GENERAL REFRIGERATION "PACKAGED" AIR-CONDITIONER

WITH "packaged" air-conditioning now coming into the full bloom of public recognition and acceptance, most of the "old timers" in the mechanical refrigeration field are entering this lucrative market with cumulatively improved units. One of the most recent of these old-timer "new-comers" is General Refrigeration Corporation, of Beloit, Wisconsin, internationally known designers and builders of Lipman commercial refrigeration units for more than twenty years.



THE GR-LIPMAN AIR CONDITIONER

The GR-Lipman line of packaged air-conditioning units includes five models, in two different types . . . one for home and office use, and the other for commercial service. All of these models provide complete air-conditioning service . . . cooling, dehumidification, filtration, and ventilation and employ deep-coil GR-Lipman refrigerating units, using Freon-12 refrigerant.

Interesting Features

An interesting feature of the "Room Cooler" models is the lift-off type walnut cabinet. It may be removed for servicing the unit simply by detaching the two control knobs from the operating panel. Another new feature is the wide range vertical adjustment of the casters, which simplifies adjustment of the unit to uneven floors, or for lining up with windows of varying height. An adjustable air outlet grille regulates the length, angle and throw of the air stream, permitting concentration of conditioned air wherever desired, within the capacity limitations of the unit.

The two room cooler models are equipped

with ¾ and one h.p. compressors respectively.

The store conditioner is available in three sizes . . . 2, 3 and 5 h.p. These units are so designed that they may be recessed in store shelving, if desired, as all servicing can be taken care of from the front of the unit, simply by removing the necessary steel panels. The top section of these units comprises the combination plenum chamber and silencer (readily removable for easy installation), and contains the air outlet grille. The lower section houses the condensing unit, composed of compressor, motor, condenser and electric controls. Easily removable, insulated and acoustically treated steel panels enclose the unit and all mechanism is resilient mounted for quiet operation.

Large, low speed, centrifugal type, multiblade blowers recirculate air, mixing any desired quantity of indoor air with fresh outdoor air, drawn in through air ducts installed at rear or side of unit. The air mixture is cooled at low velocity in a deep core cooling coil to secure maximum dehumidification.

All units are equipped with low resistance type air filters, in easily replaced standard sizes.

Attractive literature is now available through General Refrigeration Corporation or their distributors, illustrating and describing these new "packaged" air conditioners in detail.

* * *

ROY NELSON WITH SQUARE D CO.

MR. ROY NELSON recently joined the ranks of the Square D Regulator Division where he will assist George H. Clark who has been engaged in the development of a new line of Refrigeration products.

Mr. Nelson's long experience in all phases of refrigeration work with such companies as Kelvinator, Rice Products, Fedders, Norge and others will serve him well in his new position.

* * *

A-P CO-OPERATION

AS a co-operative measure, the Automatic Products Company of Milwaukee, Wis., recently sent out a letter together with an illustrative folder to all drug stores and meat markets in the Chicago area. The theme of the letter and folder is found in

Classified Ads

Rate: Two Dollars for fifty words or less. 30 cents for each additional ten words or less.

POSITION WANTED—Young man 23 years old, technically trained, four years experience installing, servicing and rebuilding commercial refrigeration equipment, and two years experience as engineer for a 120-ton ammonia plant. Have own tools and equipment. Now employed but would like to make other connection. Address Box 102, THE REFRIGERATION SERVICE ENGINEER, 435 N. Waller Ave., Chicago, Ill.

WANTED TO BUY—Am interested in purchasing a refrigeration service business and appliance repair shop. Location is not as important as the desire for year round business. Would prefer a location where refrigeration service is the active summer business and heating and other domestic appliance service provides winter business. If you have such a location, I am interested. Address Box 639, The Refrigeration Service Engineer, 433 N. Waller Ave., Chicago, Ill.

BOOKS FOR SALE—Write to Nickerson & Collins Co. for a complete list of books on Air Conditioning, Refrigeration, Ice Making, Cold Storage, Food Handling, Heating, Diesel, Oil, and Steam Engines, Domestic and Small Commercial Machines, and others. These are the best books published today on Refrigeration and related subjects. Nickerson & Collins Co., 435 N. Waller Ave., Chicago, Ill.

its title—"Ounces of Prevention." They impress on the owner the importance of a regular check-up by a service engineer.

A second letter, together with a copy of the above-mentioned letter and folder has been sent to all refrigeration men in the area which in part states:

"The purpose of this mailing has been to help you, the Service Engineer, to increase business in two respects: First, increasing your sale of A-P Thermostatic Expansion Valves, by telling your customers of their advantages in more efficient and dependable refrigeration. Second, to increase your service business by suggesting the advantages of a regular check-up as an 'Ounce of Prevention' to avoid major repairs and expense."

RIECKELMAN TO REPRESENT WOLVERINE TUBE CO.

MR. H. E. RIECKELMAN has been appointed by Wolverine Tube Company, Detroit, Michigan, as Sales Representative covering all classes of trade in upper and western New York State. Mr. Rieckelman will make his headquarters in Buffalo.

SHAFFNER LUKENS DIES

SHAFFNER LUKENS, for 20 years a member of the sales organization of the L. H. Gilmer Company, died July 21st, after a brief illness.

Mr. Lukens joined the Gilmer Company in the early days of the automotive fan belt industry and was one of those who developed the grouping and listing of belts as they are now catalogued. In recent years he devoted his attention to the Gilmer refrigerator belt line, on the specifications for which he became an authority.

He was widely known throughout the automotive and refrigeration industries both among manufacturers and in the replacement trade, where his thorough knowledge of stocking requirements, combined with a genial, helpful personality, made his customers to be counted among his warmest friends.

Mr. Lukens was a charter member of the Boosters Club of Philadelphia, and a 32nd Degree Mason, member of Crescent Lodge 493, LuLu Temple and the Philadelphia Consistory.

M.R.S.J.A. HOLD MEETING

THE Midwest Refrigeration Supply Jobbers Association recently held a meeting at the Hotel Fort Des Moines in Des Moines, Iowa. This meeting began with a luncheon and there were four factory representatives present.

A round table discussion was held which was enjoyed by all present. Among the topics which came up for discussion was "the delivery service of refrigeration supply jobbers," and "The sale of supplies to State Institutions at dealer prices." It was also suggested that a booklet be printed by jobbers on what the jobber means to the refrigeration serviceman or dealer.

It was decided to invite a number of refrigeration supply jobbers in the midwest territory to become members of the Midwest Jobbers Association.

* * *

DELAVAN ENGINEERING TO REPRESENT VIRGINIA SMELTING

DELAVAN ENGINEERING COMPANY, manufacturers' sales representatives, 414 12th St., Des Moines, Iowa, is pleased to announce their recent appointment as exclusive representatives for Iowa-Nebraska-Minnesota and North and South Dakota for Virginia Smelting Company.

Warehouse stocks of refrigerants are maintained at Des Moines for prompt service.

The addition of the Virginia line of refrigerants, and refrigeration supplies adds materially to the service which Delavan Engineering Co. now renders to the refrigeration trade, since it already represents Automatic Products Company, Henry Valve Company, L. H. Gilmer Co., Maurey Mfg. Co., J. E. Lonergan Co., as well as other accessory manufacturers.

* * *

HEATING CALCULATOR

A NEW heating calculator designed by Mr. S. Dunagan of Detroit, Michigan, is now being introduced to the heating and air conditioning industry. The calculator is in circular form about five inches in diameter, and is sturdily made of celluloid.

Total heat losses through any type of construction can be quickly determined. Air infiltration and air circulation are among the other calculations which can be made with the calculator.

Index to Advertisements

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BONNEY TOOLS

Good Tools Are Cheap- It Pays to Buy the Best

YEAR after year they give you service possible to obtain only with good tools. They fit your hand comfortably, retain their original finish, do the job intended for easily and quickly, and have that balance which distinguishes all fine tools.

Bonney Tools have all the features found only in fine tools. That's why, among experienced service men, they have gained the reputation of "The Finest That Money Can Buy." Good tools are the cheapest in the long run.

Ask your jobber for Catalog No. 39R or write direct—and the next time you buy tools, ask for "Bonney Tools."

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In Canada—Gray-Bonney Tool Co., Ltd., Toronto
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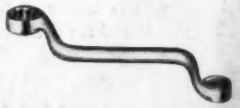
Hack Saw Frame—adjustable for from 8" to 12" blades. Flexible Tungsten and High Speed Steel Blades to meet every cutting problem.

Tube Cutters—two types—for from ⅛" to 1" tubing. Fast, efficient tools, reasonably priced.

Pliers—a type and size to meet every need for tools of this kind.



Special Refrigeration Box Wrenches—designed with very thin walls for working in close quarters, yet with that exceptional strength for which all Bonney Tools are famous.

Miniature Wrenches—box and open end types, for adjustments on switches, small valves and electrical apparatus, etc.

BONNEY TOOLS FOR REFRIGERATION SERVI